DPW ENGINEERING DIVISION

TOWN OF LEXINGTON, MASSACHUSETTS

TOWN OF LEXINGTON, MASSACHUSETTS

LEXINGTON TOWN CENTER TRAFFIC AND STREETSCAPE IMPROVEMENTS

CONTRACT #21-33

February 2021

KIEN Y.
HO
CIVIL ENGINEER
No. 46[illegible]31

Kien Ho

2/8/21

Prepared by:

BETA
www.BETA-Inc.com

TOWN OF LEXINGTON, MASSACHUSETTS

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CONTRACT #21-33

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THE TOWN OF LEXINGTON, MASSACHUSETTS
INVITES PROPOSALS
LEXINGTON TOWN CENTER
TRAFFIC AND STREETSCAPE IMPROVEMENTS
CONTRACT # 21-33

The Town of Lexington, Massachusetts, through its Town Manager, will receive bids for Lexington Town Center, Traffic and Streetscape Improvements in the Town of Lexington, Massachusetts, until **12:00 P.M.**, Local Time, **Tuesday March 09, 2021** at the Town Office Building, 1625 Massachusetts Avenue, Procurement Office, Third Floor, Lexington, Massachusetts. A payment bond and performance bond of not less than the amount of the contract, with satisfactory surety, for faithfully doing the work will be required.

Plans and specifications that include the required bid forms can be viewed as PDF and ordered for printing at www.accentblueprints.com. A copy fee is charged for printed copies. They can be picked up at Accent Printing, 99 Chelmsford Rd, N. Billerica, MA 01862 (978-362-8038.) Copies can be shipped on order upon payment of handling and mailing fee.

The proposal must be filled out and signed as directed therein, sealed in an envelope addressed to the Town Manager, Lexington, Massachusetts, endorsed with the name and address of the bidder, and marked "Lexington Town Center Project", and left with either a bid bond in accordance with Chapter 30, Section 39M or a certified treasurer's or cashier's check issued by a responsible bank, for 5 percent of the bid for the proposed work payable to the Town of Lexington, Massachusetts, before **12:00 P.M.**, Local Time, **Tuesday March 09, 2021.** This check to be the property of said Town if the Bidder fails to execute the contract and satisfactory bond within ten (10) days after the contract may have been awarded to him.

Attention is called to the fact that State Prevailing Wage Rates are established for the project as set forth in the contract documents.

Proposals filled out and left, with check or bid bond, as above directed and no others, will, at the above-named hour, be publicly opened and read virtually via Zoom. **Due to restrictions imposed by the COVID-19 pandemic, the Town will hold a virtual bid opening via Zoom Meetings in order to satisfy the public bid opening requirement. Please email Elizabeth Mancini- emancini@lexingtonma.gov prior to Tuesday, March 9, 2021 in order to obtain the virtual meeting details.**

Sealed bids will be accepted at **The Town Office Building, 1625 Massachusetts Ave., Lexington, MA 02420 until 12:00 pm on Tuesday, March 9, 2021. Specific delivery instructions are as follows:**

- **Bids sent via mail or courier should be addressed to Elizabeth Mancini, Purchasing Director, 1625 Massachusetts Ave, Lexington, MA 02420.**
- **Bids NOT sent via mail or courier should be hand-delivered to the Procurement Lock-Box, located outside the rear entrance of the Town Office Building (courtyard side), 1625 Massachusetts Ave, Lexington, MA 02420. The Lock-Box will be checked for bids at the specific due date and time. In the event your bid submission does not fit into the lock-box or you encounter other difficulties, please call Elizabeth Mancini for assistance- 781-698-4628.**

The undersigned reserves the right to reject any or all proposals, or to accept the proposal they deem best for the Town.

The bidder shall start the work under the contract within thirty (30) calendar days excluding Saturdays, Sundays, and Holidays, after the date of the contract.

No proposal may be withdrawn within thirty (30) days after the opening of bids.

The Town will hold a MANDATORY Pre-Bid Conference on **Thursday February 25, 2021 at 11 AM at Emery Park in Lexington which is along Massachusetts Avenue directly in front of 13 Depot Square Lexington Historical Society. Social distancing as well as masks will be required throughout the pre-bid conference so please send only those necessary to attend.**

All pre-bid questions concerning the contract documents and the work contained therein **must be submitted in writing to, and received by, John Livsey P.E., Town Engineer via email at jlivsey@lexingtonma.gov before Tuesday, March 02, 2021.**

ABILITY AND EXPERIENCE OF BIDDER

A. The bidder shall provide a minimum of 5 references including project name, owner, contact name and number for projects that are similar in nature, size and complexity to this project scope completed, or still in progress, within the last 5 years. No award will be made to any bidder who cannot satisfy the Owner that bidder has sufficient ability and experience in this class of work and sufficient capital and personnel to enable bidder to prosecute and complete the Work successfully within the time named. The Engineer and the Owner may make such investigation as they deem necessary to determine the ability of the bidder to perform the work; and the bidder shall furnish to the Engineer and the Owner all such information and data for this purpose as the Engineer and the Owner may request.

B. The Owner reserves the right to reject any bid if the evidence submitted by, or investigation of, such bidder fails to satisfy the Owner that such bidder is properly qualified to carry out the obligations of the Contract and to complete the Work contemplated therein within the time stated. The Owner's decision or judgment on these matters shall be final, conclusive, and binding for all parties involved.

Project value is estimated to be $7,500,000.00.

The Town of Lexington reserves the right to reject any and all bids if it be in the public interest to do so.

TOWN OF LEXINGTON, MASSACHUSETTS
Elizabeth Mancini
Purchasing Director
emancini@lexingtonma.gov
781-698-4628

TOWN OF LEXINGTON, MASSACHUSETTS

INSTRUCTIONS TO BIDDERS

1. Receipt of Bids

The Town may consider informal any bid not prepared and submitted in accordance with the provisions hereof and may waive any informalities in or reject any and all bids. Any bid may be withdrawn prior to the above-mentioned time for the opening of bids or authorized postponement thereof. Any bid received after the time and date specified shall not be considered. No bidder may withdraw his/her bid for a period of 30 days, excluding Saturdays, Sundays, and legal holidays after actual date of the opening thereof.

2. Preparation of Bid

Each bid shall be submitted on the forms attached to these documents. The bid forms shall not be removed and submitted separately from the other documents. All blank spaces for bid prices must be filled in with the unit price for the item or the lump sum for which the proposal is made. Bidders must bid on each item including the supplemental section. All entries in the entire proposal must be made clearly, and prices must be written in both words and figures in the spaces provided. The town reserves the right to remove the supplemental bid from this contract.

3. Bid Submission

Each bid must be submitted in a sealed envelope bearing on the outside the name of the bidder, his/her address, and the name of the project for which the bid is submitted, and the name and number of the Contract for which the bid is submitted. If forwarded by mail or courier, the sealed envelope containing the bid must be enclosed in another envelope addressed as follows:

Bid Documents
Elizabeth Mancini, Purchasing Director
LEXINGTON TOWN CENTER IMPROVEMNTS PROJECT #21-33
1625 Massachusetts Ave.
Lexington, MA 02420

Sealed bids will be accepted at **The Town Office Building, 1625 Massachusetts Ave., Lexington, MA 02420 until 12:00 pm on Tuesday, March 2, 2021. Specific delivery instructions are as follows:**

- **Bids sent via mail or courier should be addressed to Elizabeth Mancini, Purchasing Director, 1625 Massachusetts Ave, Lexington, MA 02420.**
- **Bids NOT sent via mail or courier should be hand-delivered to the Procurement Lock-Box, located outside the rear entrance of the Town Office Building (courtyard side), 1625 Massachusetts Ave, Lexington, MA 02420. The Lock-Box will be checked for bids at the specific due date and time. In the event your bid submission does not fit into the lock-box or you encounter other difficulties, please call Elizabeth Mancini for assistance- 781-698-4628.**

The Owner will receive sealed bids until the time, and at the location designated above and in the Notice to Contractors. Bids received after this time will not be accepted. All interested parties are invited to attend; bids will be opened publicly and read aloud.

4. Bid Security

Every bid submitted by contractors shall be accompanied by a bid deposit in the form of cash, certified check, treasurer's or cashier's check, or a bid bond issued by a responsible bank or trust company and made payable to the

Town of Lexington. The amount of the bid deposit shall be 5% of the amount of the bid. All security except those of the three lowest responsible and eligible bidders will be returned within five days, Saturdays, Sundays, and legal holidays excluded, after opening of the proposal. All bid securities will be returned on the execution of the contract or if no award is made within 30 days, excluding Saturdays, Sundays, and legal holidays, after the actual date of the opening thereof, unless forfeited under the conditions herein stipulated.

In case a party to whom a contract is awarded shall fail or neglect to execute the contract and furnish the satisfactory bond in the time specified, the Town may determine the bidder has abandoned the contract and thereupon the proposal and acceptance shall be null and void, and the bid security accompanying the proposal shall be forfeited to the Town as liquidation damages for such failure or neglect and indemnify the Town for any loss which may be sustained by failure of the bidder to execute the contract and furnish the bonds as aforesaid, provided that, in case of death, disability, or other unforeseen circumstances affecting the bidder, such bid security may be returned to him/her. After execution of the contract and acceptance of the bonds by the Town, the bid security accompanying the proposal of the successful bidder will be returned.

5. Time of Completion

The bidder must agree to commence work within the time specified in the contract documents, and to fully complete the project no later than **November 15, 2022**. See subsection 8.03, “Prosecution of Work” for sequence of completion.

6. Performance and Payment Bonds

A bond (performance bond) in the sum of the total amount (100%) of the Contract by the successful bidder and an additional bond in equal amount covering the payment for all labor and materials (payment bond) used in the work will be required. These bonds must be provided by a surety company that is listed with the Commonwealth of Massachusetts Approved Surety List. These bonds will be required at the execution of the contract. Attorneys-in-fact who sign contract bonds must file with each bond a certified and effectively dated copy of their power of attorney.

7. OSHA ten certification

All persons employed at the worksite must have successfully completed at least ten hours of an OSHA certified construction safety and health training. The ‘Certificate of OSHA training of personnel’ form attached in the contract must be signed and proof of training provided along with the first certified payroll.

8. Laws and Regulations

The bidder's attention is directed to the fact that all applicable State laws, municipal ordinances, and the rules and regulations of all authorities having jurisdiction over construction of the project shall apply to the contract throughout, and they will be deemed to be included in the contract the same as though herein written out in full.

9. Withdrawal of Bids

Except as hereinafter expressly provided, a bidder may not withdraw his bid until after thirty, (30) consecutive calendar days after the actual date of opening of Bids.

Upon proper written request and identification, Bids may be withdrawn only as follows:

1. At any time prior to the designated time for the opening of Bids.
2. Death or serious injury of a principal.
3. With the approval of the Town.

4. At any time after the expiration of the period during which withdrawal is prohibited provided the bid has not been accepted by the Town.

10. Execution of Contract

The party to whom the contract is awarded will be required to execute the contract and furnish the bonds duly executed with a satisfactory surety company within five days, excluding Saturdays, Sundays, and legal holidays, of the date of the mailing of the notice to the bidder according to the address given by him, that the contract is ready for execution.

11. Obligation of Bidder

At the time of the opening of bids, each bidder will be presumed to have inspected the site and to have read and to be thoroughly familiar with the drawings and contract documents, including all referenced documents. The failure or omission of any bidder to receive or examine any form, instrument, or document shall in no way relieve any bidder from the obligation in respect to his bid.

11. Omissions, Discrepancies, Interpretations and Addenda

Should a bidder find discrepancies in, or omissions from, the drawings or contract documents, or should he/she have questions as to the interpretation of the plans or contract documents he/she shall submit such in writing to the Director of Public Works at least five days before the date herein set for the opening of bids. An interpretation will be mailed by certified mail to prospective bidders at the addresses given by them on or about two days before the opening of bids. Signed copies of all addenda shall be included with the bid. Omission of the signed addendum shall be cause for rejections of the bid.

12. Record of Address

Prospective bidders shall at the time the deposit is made and plans and specifications are secured, place on file with the Director of Public Works their address, and are required to make any changes necessary to ensure that the record is accurate, complete, and up to date.

13. Massachusetts Sales and Use Tax

Materials purchased for permanent installation in the work will be exempt from the Massachusetts Sales and Use tax. Each bidder shall take this exemption into account in calculating his/her bid for the work.

14. State Tax Affidavit

Prospective bidders are required to certify that all state tax returns have been filed and all state taxes have been paid in order to be eligible to enter into a contract with the Town on this project. The form in section 0500 is to be used for this purpose and is to be completed and returned as part of the bid and proposal.

15. Prevailing Wage Rates

Prevailing rates for wages for work performed under this Contract will be as predetermined by the Commissioner of Labor and Industries of the Commonwealth of Massachusetts in accordance with the provisions of Sections 26 to 27D, inclusive, of c.149 of M.G.L. A schedule of the prevailing wages is included in Prevailing Wage Rates Section 0300.

16. Sub-bids

No sub bids will be sought in connection with this Contract.

17. Bid Deposit

A bid document deposit is not required to receive bids as they are distributed electronically. This DOES NOT exempt bidders from providing 5% bid security described in item 4 above.

TOWN OF LEXINGTON
PREVAILING WAGE RATES

A schedule of Prevailing wage rates excerpted from that for “Mechanics, Apprentices, Teamsters, Chauffeurs, and Laborers” issued for this work by the Commissioner of Labor and Industries of Massachusetts, in accordance with Chapter 461, Acts of 1935, is included at the back of this section.

THE COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF LABOR AND WORKFORCE DEVELOPMENT
DEPARTMENT OF LABOR STANDARDS

Prevailing Wage Rates

As determined by the Director under the provisions of the
Massachusetts General Laws, Chapter 149, Sections 26 to 27H

CHARLES D. BAKER
Governor

KARYN E. POLITO
Lt. Governor

ROSALIN ACOSTA
Secretary
MICHAEL FLANAGAN
Director

Awarding Authority: Town of Lexington

Contract Number: 21-33 **City/Town:** LEXINGTON

Description of Work: The Work consists of, but is not limited to, the roadway and streetscape improvements along Massachusetts Avenue between Meriam Street and the Cary Hall Entrance.

Job Location: Massachusetts Avenue

Information about Prevailing Wage Schedules for Awarding Authorities and Contractors

- This wage schedule applies only to the specific project referenced at the top of this page and uniquely identified by the “Wage Request Number” on all pages of this schedule.
- An Awarding Authority must request an updated wage schedule from the Department of Labor Standards (“DLS”) if it has not opened bids or selected a contractor within 90 days of the date of issuance of the wage schedule. For CM AT RISK projects (bid pursuant to G.L. c.149A), the earlier of: (a) the execution date of the GMP Amendment, or (b) the bid for the first construction scope of work must be within 90-days of the wage schedule issuance date.
- The wage schedule shall be incorporated in any advertisement or call for bids for the project as required by M.G.L. c. 149, § 27. The wage schedule shall be made a part of the contract awarded for the project. The wage schedule must be posted in a conspicuous place at the work site for the life of the project in accordance with M.G.L. c. 149 § 27. The wages listed on the wage schedule must be paid to employees performing construction work on the project whether they are employed by the prime contractor, a filed sub-bidder, or any sub-contractor.
- All apprentices working on the project are required to be registered with the Massachusetts Department of Labor Standards, Division of Apprentice Standards (DLS/DAS). Apprentice must keep his/her apprentice identification card on his/her person during all work hours on the project. An apprentice registered with DAS may be paid the lower apprentice wage rate at the applicable step as provided on the prevailing wage schedule. **Any apprentice not registered with DLS/DAS regardless of whether or not they are registered with any other federal, state, local, or private agency must be paid the journeyworker's rate for the trade.**
- The wage rates will remain in effect for the duration of the project, except in the case of multi-year public construction projects. For construction projects lasting longer than one year, awarding authorities must request an updated wage schedule. Awarding authorities are required to request these updates no later than two weeks before the anniversary of the date the contract was executed by the awarding authority and the general contractor. For multi-year CM AT RISK projects, awarding authority must request an annual update no later than two weeks before the anniversary date, determined as the earlier of: (a) the execution date of the GMP Amendment, or (b) the execution date of the first amendment to permit procurement of construction services. Contractors are required to obtain the wage schedules from awarding authorities, and to pay no less than these rates to covered workers. The annual update requirement is not applicable to 27F “rental of equipment” contracts.
- Every contractor or subcontractor which performs construction work on the project is required to submit weekly payroll reports and a Statement of Compliance directly to the awarding authority by mail or email and keep them on file for three years. Each weekly payroll report must contain: the employee’s name, address, occupational classification, hours worked, and wages paid. Do not submit weekly payroll reports to DLS. A sample of a payroll reporting form may be obtained at http://www.mass.gov/dols/pw.
- Contractors with questions about the wage rates or classifications included on the wage schedule have an affirmative obligation to inquire with DLS at (617) 626-6953.
- Employees not receiving the prevailing wage rate set forth on the wage schedule may report the violation to the Fair Labor Division of the office of the Attorney General at (617) 727-3465.
- Failure of a contractor or subcontractor to pay the prevailing wage rates listed on the wage schedule to all employees who perform construction work on the project is a violation of the law and subjects the contractor or subcontractor to civil and criminal penalties.

Classification Construction	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
(2 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$36.25	$12.91	$14.82	$0.00	$63.98
	06/01/2021	$37.05	$12.91	$14.82	$0.00	$64.78
	08/01/2021	$37.05	$13.41	$14.82	$0.00	$65.28
	12/01/2021	$37.05	$13.41	$16.01	$0.00	$66.47
(3 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$36.32	$12.91	$14.82	$0.00	$64.05
	06/01/2021	$37.12	$12.91	$14.82	$0.00	$64.85
	08/01/2021	$37.12	$13.41	$14.82	$0.00	$65.35
	12/01/2021	$37.12	$13.41	$16.01	$0.00	$66.54
(4 & 5 AXLE) DRIVER - EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$36.44	$12.91	$14.82	$0.00	$64.17
	06/01/2021	$37.24	$12.91	$14.82	$0.00	$64.97
	08/01/2021	$37.24	$13.41	$14.82	$0.00	$65.47
	12/01/2021	$37.24	$13.41	$16.01	$0.00	$66.66
ADS/SUBMERSIBLE PILOT *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
AIR TRACK OPERATOR *LABORERS - ZONE 2*	12/01/2020	$35.41	$8.60	$16.06	$0.00	$60.07
	06/01/2021	$36.33	$8.60	$16.06	$0.00	$60.99
	12/01/2021	$37.24	$8.60	$16.06	$0.00	$61.90
	06/01/2022	$38.14	$8.60	$16.06	$0.00	$62.80
	12/01/2022	$38.99	$8.60	$16.06	$0.00	$63.65
	06/01/2023	$39.89	$8.60	$16.06	$0.00	$64.55
	12/01/2023	$40.79	$8.60	$16.06	$0.00	$65.45
For apprentice rates see "Apprentice- LABORER"						
AIR TRACK OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$35.41	$8.60	$16.06	$0.00	$60.07
	06/01/2021	$36.33	$8.60	$16.06	$0.00	$60.99
	12/01/2021	$37.24	$8.60	$16.06	$0.00	$61.90
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
ASBESTOS REMOVER - PIPE / MECH. EQUIPT. *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	12/01/2020	$38.10	$12.80	$9.45	$0.00	$60.35
ASPHALT RAKER *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
ASPHALT RAKER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
ASPHALT/CONCRETE/CRUSHER PLANT-ON SITE *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.98	$13.50	$15.70	$0.00	$79.18
	06/01/2021	$51.08	$13.50	$15.70	$0.00	$80.28
	12/01/2021	$52.23	$13.50	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BACKHOE/FRONT-END LOADER *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.98	$13.50	$15.70	$0.00	$79.18
	06/01/2021	$51.08	$13.50	$15.70	$0.00	$80.28
	12/01/2021	$52.23	$13.50	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
BARCO-TYPE JUMPING TAMPER *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER *LABORERS - ZONE 2*	12/01/2020	$35.41	$8.60	$16.06	$0.00	$60.07
	06/01/2021	$36.33	$8.60	$16.06	$0.00	$60.99
	12/01/2021	$37.24	$8.60	$16.06	$0.00	$61.90
	06/01/2022	$38.14	$8.60	$16.06	$0.00	$62.80
	12/01/2022	$38.99	$8.60	$16.06	$0.00	$63.65
	06/01/2023	$39.89	$8.60	$16.06	$0.00	$64.55
	12/01/2023	$40.79	$8.60	$16.06	$0.00	$65.45
For apprentice rates see "Apprentice- LABORER"						
BLOCK PAVER, RAMMER / CURB SETTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$35.41	$8.60	$16.06	$0.00	$60.07
	06/01/2021	$36.33	$8.60	$16.06	$0.00	$60.99
	12/01/2021	$37.24	$8.60	$16.06	$0.00	$61.90
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
BOILER MAKER *BOILERMAKERS LOCAL 29*	01/01/2020	$46.10	$7.07	$17.98	$0.00	$71.15

Apprentice - *BOILERMAKER - Local 29*

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	65	$29.97	$7.07	$11.69	$0.00	$48.73
2	65	$29.97	$7.07	$11.69	$0.00	$48.73
3	70	$32.27	$7.07	$12.59	$0.00	$51.93
4	75	$34.58	$7.07	$13.49	$0.00	$55.14
5	80	$36.88	$7.07	$14.38	$0.00	$58.33
6	85	$39.19	$7.07	$15.29	$0.00	$61.55
7	90	$41.49	$7.07	$16.18	$0.00	$64.74
8	95	$43.80	$7.07	$17.09	$0.00	$67.96

Notes:

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BRICK/STONE/ARTIFICIAL MASONRY (INCL. MASONRY WATERPROOFING) *BRICKLAYERS LOCAL 3 (WALTHAM)*	02/01/2021	$55.75	$11.39	$22.09	$0.00	$89.23
	08/01/2021	$57.15	$11.39	$22.25	$0.00	$90.79
	02/01/2022	$57.74	$11.39	$22.25	$0.00	$91.38

Apprentice - *BRICK/PLASTER/CEMENT MASON - Local 3 Waltham*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.88	$11.39	$22.09	$0.00	$61.36
2	60	$33.45	$11.39	$22.09	$0.00	$66.93
3	70	$39.03	$11.39	$22.09	$0.00	$72.51
4	80	$44.60	$11.39	$22.09	$0.00	$78.08
5	90	$50.18	$11.39	$22.09	$0.00	$83.66

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.58	$11.39	$22.25	$0.00	$62.22
2	60	$34.29	$11.39	$22.25	$0.00	$67.93
3	70	$40.01	$11.39	$22.25	$0.00	$73.65
4	80	$45.72	$11.39	$22.25	$0.00	$79.36
5	90	$51.44	$11.39	$22.25	$0.00	$85.08

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
BULLDOZER/GRADER/SCRAPER *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
CAISSON & UNDERPINNING BOTTOM MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2020	$41.05	$8.60	$17.47	$0.00	$67.12
	06/01/2021	$42.07	$8.60	$17.47	$0.00	$68.14
	12/01/2021	$43.08	$8.60	$17.47	$0.00	$69.15
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2020	$39.90	$8.60	$17.47	$0.00	$65.97
	06/01/2021	$40.92	$8.60	$17.47	$0.00	$66.99
	12/01/2021	$41.93	$8.60	$17.47	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CAISSON & UNDERPINNING TOP MAN *LABORERS - FOUNDATION AND MARINE*	12/01/2020	$39.90	$8.60	$17.47	$0.00	$65.97
	06/01/2021	$40.92	$8.60	$17.47	$0.00	$66.99
	12/01/2021	$41.93	$8.60	$17.47	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
CARBIDE CORE DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARPENTER *CARPENTERS -ZONE 2 (Eastern Massachusetts)*	09/01/2020	$42.94	$9.40	$18.95	$0.00	$71.29
	03/01/2021	$43.54	$9.40	$18.95	$0.00	$71.89
	09/01/2021	$44.19	$9.40	$18.95	$0.00	$72.54
	03/01/2022	$44.79	$9.40	$18.95	$0.00	$73.14
	09/01/2022	$45.44	$9.40	$18.95	$0.00	$73.79
	03/01/2023	$46.04	$9.40	$18.95	$0.00	$74.39

Apprentice - *CARPENTER - Zone 2 Eastern MA*

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.47	$9.40	$1.73	$0.00	$32.60
2	60	$25.76	$9.40	$1.73	$0.00	$36.89
3	70	$30.06	$9.40	$13.76	$0.00	$53.22
4	75	$32.21	$9.40	$13.76	$0.00	$55.37
5	80	$34.35	$9.40	$15.49	$0.00	$59.24
6	80	$34.35	$9.40	$15.49	$0.00	$59.24
7	90	$38.65	$9.40	$17.22	$0.00	$65.27
8	90	$38.65	$9.40	$17.22	$0.00	$65.27

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.77	$9.40	$1.73	$0.00	$32.90
2	60	$26.12	$9.40	$1.73	$0.00	$37.25
3	70	$30.48	$9.40	$13.76	$0.00	$53.64
4	75	$32.66	$9.40	$13.76	$0.00	$55.82
5	80	$34.83	$9.40	$15.49	$0.00	$59.72
6	80	$34.83	$9.40	$15.49	$0.00	$59.72
7	90	$39.19	$9.40	$17.22	$0.00	$65.81
8	90	$39.19	$9.40	$17.22	$0.00	$65.81

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $30.45/ 3&4 $36.42/ 5&6 $54.95/ 7&8 $60.97

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CARPENTER WOOD FRAME *CARPENTERS -ZONE 2 (Wood Frame)*	04/01/2020	$27.12	$7.21	$5.80	$0.00	$40.13
	04/01/2021	$27.87	$7.21	$5.80	$0.00	$40.88
	04/01/2022	$28.62	$7.21	$5.80	$0.00	$41.63
	04/01/2023	$28.97	$7.21	$5.80	$0.00	$41.98

All Aspects of New Wood Frame Work

Apprentice - *CARPENTER (Wood Frame) - Zone 2*

Effective Date - 04/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.27	$7.21	$0.00	$0.00	$23.48
2	60	$16.27	$7.21	$0.00	$0.00	$23.48
3	65	$17.63	$7.21	$2.00	$0.00	$26.84
4	70	$18.98	$7.21	$2.00	$0.00	$28.19
5	75	$20.34	$7.21	$5.80	$0.00	$33.35
6	80	$21.70	$7.21	$5.80	$0.00	$34.71
7	85	$23.05	$7.21	$5.80	$0.00	$36.06
8	90	$24.41	$7.21	$5.80	$0.00	$37.42

Effective Date - 04/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$16.72	$7.21	$0.00	$0.00	$23.93
2	60	$16.72	$7.21	$0.00	$0.00	$23.93
3	65	$18.12	$7.21	$2.00	$0.00	$27.33
4	70	$19.51	$7.21	$2.00	$0.00	$28.72
5	75	$20.90	$7.21	$5.80	$0.00	$33.91
6	80	$22.30	$7.21	$5.80	$0.00	$35.31
7	85	$23.69	$7.21	$5.80	$0.00	$36.70
8	90	$25.08	$7.21	$5.80	$0.00	$38.09

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $19.41/ 3&4 $24.13/ 5&6 $31.99/ 7&8 $34.71

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CEMENT MASONRY/PLASTERING *BRICKLAYERS LOCAL 3 (WALTHAM)*	01/01/2020	$49.07	$12.75	$22.41	$0.62	$84.85

Apprentice - *CEMENT MASONRY/PLASTERING - Eastern Mass (Waltham)*

Effective Date - 01/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$12.75	$15.41	$0.00	$52.70
2	60	$29.44	$12.75	$17.41	$0.62	$60.22
3	65	$31.90	$12.75	$18.41	$0.62	$63.68
4	70	$34.35	$12.75	$19.41	$0.62	$67.13
5	75	$36.80	$12.75	$20.41	$0.62	$70.58
6	80	$39.26	$12.75	$21.41	$0.62	$74.04
7	90	$44.16	$12.75	$22.41	$0.62	$79.94

Notes:

Steps 3,4 are 500 hrs. All other steps are 1,000 hrs.

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CHAIN SAW OPERATOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
CLAM SHELLS/SLURRY BUCKETS/HEADING MACHINES *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$50.98	$13.50	$15.70	$0.00	$80.18
	06/01/2021	$52.08	$13.50	$15.70	$0.00	$81.28
	12/01/2021	$53.23	$13.50	$15.70	$0.00	$82.43

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
COMPRESSOR OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$33.00	$13.50	$15.70	$0.00	$62.20
	06/01/2021	$33.75	$13.50	$15.70	$0.00	$62.95
	12/01/2021	$34.54	$13.50	$15.70	$0.00	$63.74

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DELEADER (BRIDGE) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$52.06	$8.25	$22.75	$0.00	$83.06

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.03	$8.25	$0.00	$0.00	$34.28
2	55	$28.63	$8.25	$6.16	$0.00	$43.04
3	60	$31.24	$8.25	$6.72	$0.00	$46.21
4	65	$33.84	$8.25	$7.28	$0.00	$49.37
5	70	$36.44	$8.25	$19.39	$0.00	$64.08
6	75	$39.05	$8.25	$19.95	$0.00	$67.25
7	80	$41.65	$8.25	$20.51	$0.00	$70.41
8	90	$46.85	$8.25	$21.63	$0.00	$76.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: ADZEMAN *LABORERS - ZONE 2*	12/01/2020	$40.05	$8.60	$17.32	$0.00	$65.97
	06/01/2021	$41.07	$8.60	$17.32	$0.00	$66.99
	12/01/2021	$42.08	$8.60	$17.32	$0.00	$68.00
	06/01/2022	$43.08	$8.60	$17.32	$0.00	$69.00
	12/01/2022	$44.08	$8.60	$17.32	$0.00	$70.00
	06/01/2023	$45.08	$8.60	$17.32	$0.00	$71.00
	12/01/2023	$46.33	$8.60	$17.32	$0.00	$72.25

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DEMO: BACKHOE/LOADER/HAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2020	$41.05	$8.60	$17.32	$0.00	$66.97
	06/01/2021	$42.07	$8.60	$17.32	$0.00	$67.99
	12/01/2021	$43.08	$8.60	$17.32	$0.00	$69.00
	06/01/2022	$44.08	$8.60	$17.32	$0.00	$70.00
	12/01/2022	$45.08	$8.60	$17.32	$0.00	$71.00
	06/01/2023	$46.08	$8.60	$17.32	$0.00	$72.00
	12/01/2023	$47.33	$8.60	$17.32	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: BURNERS *LABORERS - ZONE 2*	12/01/2020	$40.80	$8.60	$17.32	$0.00	$66.72
	06/01/2021	$41.82	$8.60	$17.32	$0.00	$67.74
	12/01/2021	$42.83	$8.60	$17.32	$0.00	$68.75
	06/01/2022	$43.83	$8.60	$17.32	$0.00	$69.75
	12/01/2022	$44.83	$8.60	$17.32	$0.00	$70.75
	06/01/2023	$45.83	$8.60	$17.32	$0.00	$71.75
	12/01/2023	$47.08	$8.60	$17.32	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: CONCRETE CUTTER/SAWYER *LABORERS - ZONE 2*	12/01/2020	$41.05	$8.60	$17.32	$0.00	$66.97
	06/01/2021	$42.07	$8.60	$17.32	$0.00	$67.99
	12/01/2021	$43.08	$8.60	$17.32	$0.00	$69.00
	06/01/2022	$44.08	$8.60	$17.32	$0.00	$70.00
	12/01/2022	$45.08	$8.60	$17.32	$0.00	$71.00
	06/01/2023	$46.08	$8.60	$17.32	$0.00	$72.00
	12/01/2023	$47.33	$8.60	$17.32	$0.00	$73.25
For apprentice rates see "Apprentice- LABORER"						
DEMO: JACKHAMMER OPERATOR *LABORERS - ZONE 2*	12/01/2020	$40.80	$8.60	$17.32	$0.00	$66.72
	06/01/2021	$41.82	$8.60	$17.32	$0.00	$67.74
	12/01/2021	$42.83	$8.60	$17.32	$0.00	$68.75
	06/01/2022	$43.83	$8.60	$17.32	$0.00	$69.75
	12/01/2022	$44.83	$8.60	$17.32	$0.00	$70.75
	06/01/2023	$45.83	$8.60	$17.32	$0.00	$71.75
	12/01/2023	$47.08	$8.60	$17.32	$0.00	$73.00
For apprentice rates see "Apprentice- LABORER"						
DEMO: WRECKING LABORER *LABORERS - ZONE 2*	12/01/2020	$40.05	$8.60	$17.32	$0.00	$65.97
	06/01/2021	$41.07	$8.60	$17.32	$0.00	$66.99
	12/01/2021	$42.08	$8.60	$17.32	$0.00	$68.00
	06/01/2022	$43.08	$8.60	$17.32	$0.00	$69.00
	12/01/2022	$44.08	$8.60	$17.32	$0.00	$70.00
	06/01/2023	$45.08	$8.60	$17.32	$0.00	$71.00
	12/01/2023	$46.33	$8.60	$17.32	$0.00	$72.25
For apprentice rates see "Apprentice- LABORER"						
DIRECTIONAL DRILL MACHINE OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
DIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$68.70	$9.40	$23.12	$0.00	$101.22
For apprentice rates see "Apprentice- PILE DRIVER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
DIVER TENDER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER TENDER (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$73.60	$9.40	$23.12	$0.00	$106.12
For apprentice rates see "Apprentice- PILE DRIVER"						
DIVER/SLURRY (EFFLUENT) *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$103.05	$9.40	$23.12	$0.00	$135.57
For apprentice rates see "Apprentice- PILE DRIVER"						
DRAWBRIDGE OPERATOR (Construction) *DRAWBRIDGE - SEIU LOCAL 888*	07/01/2020	$26.77	$6.67	$3.93	$0.16	$37.53
ELECTRICIAN *ELECTRICIANS LOCAL 103*	09/01/2020	$54.45	$13.00	$19.73	$0.00	$87.18
	03/01/2021	$55.41	$13.00	$20.01	$0.00	$88.42
	09/01/2021	$56.84	$13.00	$20.06	$0.00	$89.90
	03/01/2022	$58.04	$13.00	$20.09	$0.00	$91.13
	09/01/2022	$59.48	$13.00	$20.13	$0.00	$92.61
	03/01/2023	$60.67	$13.00	$20.17	$0.00	$93.84

Apprentice - *ELECTRICIAN - Local 103*

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$21.78	$13.00	$0.65	$0.00	$35.43
2	40	$21.78	$13.00	$0.65	$0.00	$35.43
3	45	$24.50	$13.00	$14.87	$0.00	$52.37
4	45	$24.50	$13.00	$14.87	$0.00	$52.37
5	50	$27.23	$13.00	$15.31	$0.00	$55.54
6	55	$29.95	$13.00	$15.75	$0.00	$58.70
7	60	$32.67	$13.00	$16.19	$0.00	$61.86
8	65	$35.39	$13.00	$16.63	$0.00	$65.02
9	70	$38.12	$13.00	$17.07	$0.00	$68.19
10	75	$40.84	$13.00	$17.53	$0.00	$71.37

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$22.16	$13.00	$0.66	$0.00	$35.82
2	40	$22.16	$13.00	$0.66	$0.00	$35.82
3	45	$24.93	$13.00	$15.13	$0.00	$53.06
4	45	$24.93	$13.00	$15.13	$0.00	$53.06
5	50	$27.71	$13.00	$15.57	$0.00	$56.28
6	55	$30.48	$13.00	$16.01	$0.00	$59.49
7	60	$33.25	$13.00	$16.46	$0.00	$62.71
8	65	$36.02	$13.00	$16.90	$0.00	$65.92
9	70	$38.79	$13.00	$17.34	$0.00	$69.13
10	75	$41.56	$13.00	$17.80	$0.00	$72.36

Notes: :

App Prior 1/1/03; 30/35/40/45/50/55/65/70/75/80

Apprentice to Journeyworker Ratio:2:3***

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ELEVATOR CONSTRUCTOR *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2021	$63.47	$15.88	$19.31	$0.00	$98.66
	01/01/2022	$65.62	$16.03	$20.21	$0.00	$101.86

Apprentice - *ELEVATOR CONSTRUCTOR - Local 4*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$31.74	$15.88	$0.00	$0.00	$47.62
2	55	$34.91	$15.88	$19.31	$0.00	$70.10
3	65	$41.26	$15.88	$19.31	$0.00	$76.45
4	70	$44.43	$15.88	$19.31	$0.00	$79.62
5	80	$50.78	$15.88	$19.31	$0.00	$85.97

Effective Date - 01/01/2022

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$32.81	$16.03	$0.00	$0.00	$48.84
2	55	$36.09	$16.03	$20.21	$0.00	$72.33
3	65	$42.65	$16.03	$20.21	$0.00	$78.89
4	70	$45.93	$16.03	$20.21	$0.00	$82.17
5	80	$52.50	$16.03	$20.21	$0.00	$88.74

Notes:

Steps 1-2 are 6 mos.; Steps 3-5 are 1 year

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
ELEVATOR CONSTRUCTOR HELPER *ELEVATOR CONSTRUCTORS LOCAL 4*	01/01/2021	$44.43	$15.88	$19.31	$0.00	$79.62
	01/01/2022	$45.93	$16.03	$20.21	$0.00	$82.17

For apprentice rates see "Apprentice - ELEVATOR CONSTRUCTOR"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FENCE & GUARD RAIL ERECTOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FENCE & GUARD RAIL ERECTOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.INST.PERSON-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2020	$45.23	$13.00	$15.70	$0.00	$73.93
	05/01/2021	$46.38	$13.00	$15.70	$0.00	$75.08
	11/01/2021	$47.38	$13.00	$15.70	$0.00	$76.08
	05/01/2022	$48.53	$13.00	$15.70	$0.00	$77.23

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.PARTY CHIEF-BLDG,SITE,HVY/HWY *OPERATING ENGINEERS LOCAL 4*	11/01/2020	$46.74	$13.00	$15.70	$0.00	$75.44
	05/01/2021	$47.90	$13.00	$15.70	$0.00	$76.60
	11/01/2021	$48.91	$13.00	$15.70	$0.00	$77.61
	05/01/2022	$50.07	$13.00	$15.70	$0.00	$78.77

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FIELD ENG.ROD PERSON-BLDG,SITE,HVY/HWY	11/01/2020	$22.73	$13.00	$15.70	$0.00	$51.43
OPERATING ENGINEERS LOCAL 4	05/01/2021	$23.41	$13.00	$15.70	$0.00	$52.11
	11/01/2021	$24.01	$13.00	$15.70	$0.00	$52.71
	05/01/2022	$24.68	$13.00	$15.70	$0.00	$53.38
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FIRE ALARM INSTALLER	09/01/2020	$54.45	$13.00	$19.73	$0.00	$87.18
ELECTRICIANS LOCAL 103	03/01/2021	$55.41	$13.00	$20.01	$0.00	$88.42
	09/01/2021	$56.84	$13.00	$20.06	$0.00	$89.90
	03/01/2022	$58.04	$13.00	$20.09	$0.00	$91.13
	09/01/2022	$59.48	$13.00	$20.13	$0.00	$92.61
	03/01/2023	$60.67	$13.00	$20.17	$0.00	$93.84
For apprentice rates see "Apprentice- ELECTRICIAN"						
FIRE ALARM REPAIR / MAINTENANCE / COMMISSIONING *ELECTRICIANS LOCAL 103*	09/01/2020	$40.84	$13.00	$17.53	$0.00	$71.37
	03/01/2021	$42.11	$13.00	$17.88	$0.00	$72.99
	09/01/2021	$43.77	$13.00	$18.00	$0.00	$74.77
	03/01/2022	$45.27	$13.00	$18.12	$0.00	$76.39
	09/01/2022	$46.99	$13.00	$18.24	$0.00	$78.23
	03/01/2023	$48.54	$13.00	$18.37	$0.00	$79.91
For apprentice rates see "Apprentice- TELECOMMUNICATIONS TECHNICIAN"						
FIREMAN (ASST. ENGINEER)	12/01/2020	$40.75	$13.50	$15.70	$0.00	$69.95
OPERATING ENGINEERS LOCAL 4	06/01/2021	$41.66	$13.50	$15.70	$0.00	$70.86
	12/01/2021	$42.61	$13.50	$15.70	$0.00	$71.81
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
FLAGGER & SIGNALER (HEAVY & HIGHWAY)	12/01/2020	$24.50	$8.60	$16.06	$0.00	$49.16
LABORERS - ZONE 2 (HEAVY & HIGHWAY)	06/01/2021	$24.50	$8.60	$16.06	$0.00	$49.16
	12/01/2021	$24.50	$8.60	$16.06	$0.00	$49.16
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
FLOORCOVERER	09/01/2020	$47.79	$9.40	$19.25	$0.00	$76.44
FLOORCOVERERS LOCAL 2168 ZONE I	03/01/2021	$48.59	$9.40	$19.25	$0.00	$77.24
	09/01/2021	$49.39	$9.40	$19.25	$0.00	$78.04
	03/01/2022	$50.19	$9.40	$19.25	$0.00	$78.84

Apprentice - *FLOORCOVERER - Local 2168 Zone I*

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.90	$9.40	$1.79	$0.00	$35.09
2	55	$26.28	$9.40	$1.79	$0.00	$37.47
3	60	$28.67	$9.40	$13.88	$0.00	$51.95
4	65	$31.06	$9.40	$13.88	$0.00	$54.34
5	70	$33.45	$9.40	$15.67	$0.00	$58.52
6	75	$35.84	$9.40	$15.67	$0.00	$60.91
7	80	$38.23	$9.40	$17.46	$0.00	$65.09
8	85	$40.62	$9.40	$17.46	$0.00	$67.48

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.30	$9.40	$1.79	$0.00	$35.49
2	55	$26.72	$9.40	$1.79	$0.00	$37.91
3	60	$29.15	$9.40	$13.88	$0.00	$52.43
4	65	$31.58	$9.40	$13.88	$0.00	$54.86
5	70	$34.01	$9.40	$15.67	$0.00	$59.08
6	75	$36.44	$9.40	$15.67	$0.00	$61.51
7	80	$38.87	$9.40	$17.46	$0.00	$65.73
8	85	$41.30	$9.40	$17.46	$0.00	$68.16

Notes: Steps are 750 hrs.
% After 09/1/17; 45/45/55/55/70/70/80/80 (1500hr Steps)
Step 1&2 $32.70/ 3&4 $39.20/ 5&6 $58.52/ 7&8 $65.09

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
FORK LIFT/CHERRY PICKER *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.98	$13.50	$15.70	$0.00	$79.18
	06/01/2021	$51.08	$13.50	$15.70	$0.00	$80.28
	12/01/2021	$52.23	$13.50	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GENERATOR/LIGHTING PLANT/HEATERS *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$33.00	$13.50	$15.70	$0.00	$62.20
	06/01/2021	$33.75	$13.50	$15.70	$0.00	$62.95
	12/01/2021	$34.54	$13.50	$15.70	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
GLAZIER (GLASS PLANK/AIR BARRIER/INTERIOR SYSTEMS) *GLAZIERS LOCAL 35 (ZONE 2)*	01/01/2021	$41.56	$8.25	$22.75	$0.00	$72.56

Apprentice - *GLAZIER - Local 35 Zone 2*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.78	$8.25	$0.00	$0.00	$29.03
2	55	$22.86	$8.25	$6.16	$0.00	$37.27
3	60	$24.94	$8.25	$6.72	$0.00	$39.91
4	65	$27.01	$8.25	$7.28	$0.00	$42.54
5	70	$29.09	$8.25	$19.39	$0.00	$56.73
6	75	$31.17	$8.25	$19.95	$0.00	$59.37
7	80	$33.25	$8.25	$20.51	$0.00	$62.01
8	90	$37.40	$8.25	$21.63	$0.00	$67.28

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HOISTING ENGINEER/CRANES/GRADALLS *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.98	$13.50	$15.70	$0.00	$79.18
	06/01/2021	$51.08	$13.50	$15.70	$0.00	$80.28
	12/01/2021	$52.23	$13.50	$15.70	$0.00	$81.43

Apprentice - *OPERATING ENGINEERS - Local 4*

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$27.49	$13.50	$0.00	$0.00	$40.99
2	60	$29.99	$13.50	$15.70	$0.00	$59.19
3	65	$32.49	$13.50	$15.70	$0.00	$61.69
4	70	$34.99	$13.50	$15.70	$0.00	$64.19
5	75	$37.49	$13.50	$15.70	$0.00	$66.69
6	80	$39.98	$13.50	$15.70	$0.00	$69.18
7	85	$42.48	$13.50	$15.70	$0.00	$71.68
8	90	$44.98	$13.50	$15.70	$0.00	$74.18

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$28.09	$13.50	$0.00	$0.00	$41.59
2	60	$30.65	$13.50	$15.70	$0.00	$59.85
3	65	$33.20	$13.50	$15.70	$0.00	$62.40
4	70	$35.76	$13.50	$15.70	$0.00	$64.96
5	75	$38.31	$13.50	$15.70	$0.00	$67.51
6	80	$40.86	$13.50	$15.70	$0.00	$70.06
7	85	$43.42	$13.50	$15.70	$0.00	$72.62
8	90	$45.97	$13.50	$15.70	$0.00	$75.17

Notes:

Apprentice to Journeyworker Ratio:1:6

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC (DUCTWORK) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2021	$51.67	$13.65	$24.57	$2.70	$92.59
	08/01/2021	$53.42	$13.65	$24.57	$2.75	$94.39
	02/01/2022	$55.17	$13.65	$24.57	$2.80	$96.19
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (ELECTRICAL CONTROLS) *ELECTRICIANS LOCAL 103*	09/01/2020	$54.45	$13.00	$19.73	$0.00	$87.18
	03/01/2021	$55.41	$13.00	$20.01	$0.00	$88.42
	09/01/2021	$56.84	$13.00	$20.06	$0.00	$89.90
	03/01/2022	$58.04	$13.00	$20.09	$0.00	$91.13
	09/01/2022	$59.48	$13.00	$20.13	$0.00	$92.61
	03/01/2023	$60.67	$13.00	$20.17	$0.00	$93.84
For apprentice rates see "Apprentice- ELECTRICIAN"						
HVAC (TESTING AND BALANCING - AIR) *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2021	$51.67	$13.65	$24.57	$2.70	$92.59
	08/01/2021	$53.42	$13.65	$24.57	$2.75	$94.39
	02/01/2022	$55.17	$13.65	$24.57	$2.80	$96.19
For apprentice rates see "Apprentice- SHEET METAL WORKER"						
HVAC (TESTING AND BALANCING -WATER) *PIPEFITTERS LOCAL 537*	09/01/2020	$56.44	$11.70	$20.24	$0.00	$88.38
	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88
For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HVAC MECHANIC *PIPEFITTERS LOCAL 537*	09/01/2020	$56.44	$11.70	$20.24	$0.00	$88.38
	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HYDRAULIC DRILLS *LABORERS - ZONE 2*	12/01/2020	$35.41	$8.60	$16.06	$0.00	$60.07
	06/01/2021	$36.33	$8.60	$16.06	$0.00	$60.99
	12/01/2021	$37.24	$8.60	$16.06	$0.00	$61.90
	06/01/2022	$38.14	$8.60	$16.06	$0.00	$62.80
	12/01/2022	$38.99	$8.60	$16.06	$0.00	$63.65
	06/01/2023	$39.89	$8.60	$16.06	$0.00	$64.55
	12/01/2023	$40.79	$8.60	$16.06	$0.00	$65.45

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
HYDRAULIC DRILLS (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$35.41	$8.60	$16.06	$0.00	$60.07
	06/01/2021	$36.33	$8.60	$16.06	$0.00	$60.99
	12/01/2021	$37.24	$8.60	$16.06	$0.00	$61.90

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
INSULATOR (PIPES & TANKS) *HEAT & FROST INSULATORS LOCAL 6 (BOSTON)*	09/01/2020	$49.00	$13.80	$17.14	$0.00	$79.94
	09/01/2021	$51.40	$13.80	$17.14	$0.00	$82.34
	09/01/2022	$53.85	$13.80	$17.14	$0.00	$84.79

Apprentice - *ASBESTOS INSULATOR (Pipes & Tanks) - Local 6 Boston*

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.50	$13.80	$12.42	$0.00	$50.72
2	60	$29.40	$13.80	$13.36	$0.00	$56.56
3	70	$34.30	$13.80	$14.31	$0.00	$62.41
4	80	$39.20	$13.80	$15.25	$0.00	$68.25

Effective Date - 09/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$25.70	$13.80	$12.42	$0.00	$51.92
2	60	$30.84	$13.80	$13.36	$0.00	$58.00
3	70	$35.98	$13.80	$14.31	$0.00	$64.09
4	80	$41.12	$13.80	$15.25	$0.00	$70.17

Notes:

Steps are 1 year

Apprentice to Journeyworker Ratio:1:4

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
IRONWORKER/WELDER *IRONWORKERS LOCAL 7 (BOSTON AREA)*	09/16/2020	$48.66	$8.10	$25.10	$0.00	$81.86

Apprentice - *IRONWORKER - Local 7 Boston*

Effective Date - 09/16/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$29.20	$8.10	$25.10	$0.00	$62.40
2	70	$34.06	$8.10	$25.10	$0.00	$67.26
3	75	$36.50	$8.10	$25.10	$0.00	$69.70
4	80	$38.93	$8.10	$25.10	$0.00	$72.13
5	85	$41.36	$8.10	$25.10	$0.00	$74.56
6	90	$43.79	$8.10	$25.10	$0.00	$76.99

Notes:

** Structural 1:6; Ornamental 1:4

Apprentice to Journeyworker Ratio:**

JACKHAMMER & PAVING BREAKER OPERATOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95

For apprentice rates see "Apprentice- LABORER"

LABORER *LABORERS - ZONE 2*	12/01/2020	$34.66	$8.60	$16.06	$0.00	$59.32
	06/01/2021	$35.58	$8.60	$16.06	$0.00	$60.24
	12/01/2021	$36.49	$8.60	$16.06	$0.00	$61.15
	06/01/2022	$37.39	$8.60	$16.06	$0.00	$62.05
	12/01/2022	$38.24	$8.60	$16.06	$0.00	$62.90
	06/01/2023	$39.14	$8.60	$16.06	$0.00	$63.80
	12/01/2023	$40.04	$8.60	$16.06	$0.00	$64.70

Apprentice - *LABORER - Zone 2*

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.80	$8.60	$16.06	$0.00	$45.46
2	70	$24.26	$8.60	$16.06	$0.00	$48.92
3	80	$27.73	$8.60	$16.06	$0.00	$52.39
4	90	$31.19	$8.60	$16.06	$0.00	$55.85

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.35	$8.60	$16.06	$0.00	$46.01
2	70	$24.91	$8.60	$16.06	$0.00	$49.57
3	80	$28.46	$8.60	$16.06	$0.00	$53.12
4	90	$32.02	$8.60	$16.06	$0.00	$56.68

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.66	$8.60	$16.06	$0.00	$59.32
	06/01/2021	$35.58	$8.60	$16.06	$0.00	$60.24
	12/01/2021	$36.49	$8.60	$16.06	$0.00	$61.15

Apprentice - *LABORER (Heavy & Highway) - Zone 2*

Effective Date - 12/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$20.80	$8.60	$16.06	$0.00	$45.46
2	70	$24.26	$8.60	$16.06	$0.00	$48.92
3	80	$27.73	$8.60	$16.06	$0.00	$52.39
4	90	$31.19	$8.60	$16.06	$0.00	$55.85

Effective Date - 06/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$21.35	$8.60	$16.06	$0.00	$46.01
2	70	$24.91	$8.60	$16.06	$0.00	$49.57
3	80	$28.46	$8.60	$16.06	$0.00	$53.12
4	90	$32.02	$8.60	$16.06	$0.00	$56.68

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: CARPENTER TENDER *LABORERS - ZONE 2*	12/01/2020	$34.66	$8.60	$16.06	$0.00	$59.32
	06/01/2021	$35.58	$8.60	$16.06	$0.00	$60.24
	12/01/2021	$36.49	$8.60	$16.06	$0.00	$61.15
	06/01/2022	$37.39	$8.60	$16.06	$0.00	$62.05
	12/01/2022	$38.24	$8.60	$16.06	$0.00	$62.90
	06/01/2023	$39.14	$8.60	$16.06	$0.00	$63.80
	12/01/2023	$40.04	$8.60	$16.06	$0.00	$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: CEMENT FINISHER TENDER *LABORERS - ZONE 2*	12/01/2020	$34.66	$8.60	$16.06	$0.00	$59.32
	06/01/2021	$35.58	$8.60	$16.06	$0.00	$60.24
	12/01/2021	$36.49	$8.60	$16.06	$0.00	$61.15
	06/01/2022	$37.39	$8.60	$16.06	$0.00	$62.05
	12/01/2022	$38.24	$8.60	$16.06	$0.00	$62.90
	06/01/2023	$39.14	$8.60	$16.06	$0.00	$63.80
	12/01/2023	$40.04	$8.60	$16.06	$0.00	$64.70
For apprentice rates see "Apprentice- LABORER"						
LABORER: HAZARDOUS WASTE/ASBESTOS REMOVER *LABORERS - ZONE 2*	12/01/2020	$34.75	$8.60	$16.12	$0.00	$59.47
	06/01/2021	$35.67	$8.60	$16.12	$0.00	$60.39
	12/01/2021	$36.58	$8.60	$16.12	$0.00	$61.30
	06/01/2022	$37.48	$8.60	$16.12	$0.00	$62.20
	12/01/2022	$38.33	$8.60	$16.12	$0.00	$63.05
	06/01/2023	$39.23	$8.60	$16.12	$0.00	$63.95
	12/01/2023	$40.13	$8.60	$16.12	$0.00	$64.85
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
LABORER: MASON TENDER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
LABORER: MULTI-TRADE TENDER *LABORERS - ZONE 2*	12/01/2020	$34.66	$8.60	$16.06	$0.00	$59.32
	06/01/2021	$35.58	$8.60	$16.06	$0.00	$60.24
	12/01/2021	$36.49	$8.60	$16.06	$0.00	$61.15
	06/01/2022	$37.39	$8.60	$16.06	$0.00	$62.05
	12/01/2022	$38.24	$8.60	$16.06	$0.00	$62.90
	06/01/2023	$39.14	$8.60	$16.06	$0.00	$63.80
	12/01/2023	$40.04	$8.60	$16.06	$0.00	$64.70
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LABORER: TREE REMOVER *LABORERS - ZONE 2*	12/01/2020	$34.66	$8.60	$16.06	$0.00	$59.32
	06/01/2021	$35.58	$8.60	$16.06	$0.00	$60.24
	12/01/2021	$36.49	$8.60	$16.06	$0.00	$61.15
	06/01/2022	$37.39	$8.60	$16.06	$0.00	$62.05
	12/01/2022	$38.24	$8.60	$16.06	$0.00	$62.90
	06/01/2023	$39.14	$8.60	$16.06	$0.00	$63.80
	12/01/2023	$40.04	$8.60	$16.06	$0.00	$64.70

This classification applies to the removal of standing trees, and the trimming and removal of branches and limbs when related to public works construction or site clearance incidental to construction . For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LASER BEAM OPERATOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
LASER BEAM OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE & TILE FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2021	$42.57	$11.39	$20.14	$0.00	$74.10
	08/01/2021	$43.69	$11.39	$20.30	$0.00	$75.38
	02/01/2022	$44.16	$11.39	$20.30	$0.00	$75.85

Apprentice - *MARBLE & TILE FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.29	$11.39	$20.14	$0.00	$52.82
2	60	$25.54	$11.39	$20.14	$0.00	$57.07
3	70	$29.80	$11.39	$20.14	$0.00	$61.33
4	80	$34.06	$11.39	$20.14	$0.00	$65.59
5	90	$38.31	$11.39	$20.14	$0.00	$69.84

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.85	$11.39	$20.30	$0.00	$53.54
2	60	$26.21	$11.39	$20.30	$0.00	$57.90
3	70	$30.58	$11.39	$20.30	$0.00	$62.27
4	80	$34.95	$11.39	$20.30	$0.00	$66.64
5	90	$39.32	$11.39	$20.30	$0.00	$71.01

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MARBLE MASONS,TILELAYERS & TERRAZZO MECH *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2021	$55.77	$11.39	$22.08	$0.00	$89.24
	08/01/2021	$57.17	$11.39	$22.24	$0.00	$90.80
	02/01/2022	$57.74	$11.39	$22.24	$0.00	$91.37

Apprentice - *MARBLE-TILE-TERRAZZO MECHANIC - Local 3 Marble & Tile*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.89	$11.39	$22.08	$0.00	$61.36
2	60	$33.46	$11.39	$22.08	$0.00	$66.93
3	70	$39.04	$11.39	$22.08	$0.00	$72.51
4	80	$44.62	$11.39	$22.08	$0.00	$78.09
5	90	$50.19	$11.39	$22.08	$0.00	$83.66

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.59	$11.39	$22.24	$0.00	$62.22
2	60	$34.30	$11.39	$22.24	$0.00	$67.93
3	70	$40.02	$11.39	$22.24	$0.00	$73.65
4	80	$45.74	$11.39	$22.24	$0.00	$79.37
5	90	$51.45	$11.39	$22.24	$0.00	$85.08

Notes:

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MECH. SWEEPER OPERATOR (ON CONST. SITES) *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MECHANICS MAINTENANCE *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
MILLWRIGHT (Zone 1) *MILLWRIGHTS LOCAL 1121 - Zone 1*	01/04/2021	$44.07	$9.40	$20.45	$0.00	$73.92
	01/03/2022	$45.82	$9.40	$20.45	$0.00	$75.67
	01/02/2023	$47.57	$9.40	$20.45	$0.00	$77.42

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate

Apprentice - *MILLWRIGHT - Local 1121 Zone 1*
Effective Date - 01/04/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	55	$24.24	$9.40	$5.58	$0.00	$39.22
2	65	$28.65	$9.40	$16.90	$0.00	$54.95
3	75	$33.05	$9.40	$17.92	$0.00	$60.37
4	85	$37.46	$9.40	$18.93	$0.00	$65.79

Notes: Step 1&2 Appr. indentured after 1/1/2020 receive no pension,
but do receive annuity. (Step 1 $5.58, Step 2 $6.50)
Steps are 2,000 hours

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
MORTAR MIXER *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
OILER (OTHER THAN TRUCK CRANES,GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$23.20	$13.50	$15.70	$0.00	$52.40
	06/01/2021	$23.75	$13.50	$15.70	$0.00	$52.95
	12/01/2021	$24.33	$13.50	$15.70	$0.00	$53.53
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OILER (TRUCK CRANES, GRADALLS) *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$27.97	$13.50	$15.70	$0.00	$57.17
	06/01/2021	$28.61	$13.50	$15.70	$0.00	$57.81
	12/01/2021	$29.29	$13.50	$15.70	$0.00	$58.49
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
OTHER POWER DRIVEN EQUIPMENT - CLASS II *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PAINTER (BRIDGES/TANKS) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$52.06	$8.25	$22.75	$0.00	$83.06

Apprentice - *PAINTER Local 35 - BRIDGES/TANKS*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$26.03	$8.25	$0.00	$0.00	$34.28
2	55	$28.63	$8.25	$6.16	$0.00	$43.04
3	60	$31.24	$8.25	$6.72	$0.00	$46.21
4	65	$33.84	$8.25	$7.28	$0.00	$49.37
5	70	$36.44	$8.25	$19.39	$0.00	$64.08
6	75	$39.05	$8.25	$19.95	$0.00	$67.25
7	80	$41.65	$8.25	$20.51	$0.00	$70.41
8	90	$46.85	$8.25	$21.63	$0.00	$76.73

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER (SPRAY OR SANDBLAST, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$42.96	$8.25	$22.75	$0.00	$73.96

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - New*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$21.48	$8.25	$0.00	$0.00	$29.73
2	55	$23.63	$8.25	$6.16	$0.00	$38.04
3	60	$25.78	$8.25	$6.72	$0.00	$40.75
4	65	$27.92	$8.25	$7.28	$0.00	$43.45
5	70	$30.07	$8.25	$19.39	$0.00	$57.71
6	75	$32.22	$8.25	$19.95	$0.00	$60.42
7	80	$34.37	$8.25	$20.51	$0.00	$63.13
8	90	$38.66	$8.25	$21.63	$0.00	$68.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER (SPRAY OR SANDBLAST, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$41.02	$8.25	$22.75	$0.00	$72.02

Apprentice - *PAINTER Local 35 Zone 2 - Spray/Sandblast - Repaint*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.51	$8.25	$0.00	$0.00	$28.76
2	55	$22.56	$8.25	$6.16	$0.00	$36.97
3	60	$24.61	$8.25	$6.72	$0.00	$39.58
4	65	$26.66	$8.25	$7.28	$0.00	$42.19
5	70	$28.71	$8.25	$19.39	$0.00	$56.35
6	75	$30.77	$8.25	$19.95	$0.00	$58.97
7	80	$32.82	$8.25	$20.51	$0.00	$61.58
8	90	$36.92	$8.25	$21.63	$0.00	$66.80

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, NEW) * * If 30% or more of surfaces to be painted are new construction, NEW paint rate shall be used.*PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$41.56	$8.25	$22.75	$0.00	$72.56

Apprentice - *PAINTER - Local 35 Zone 2 - BRUSH NEW*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$20.78	$8.25	$0.00	$0.00	$29.03
2	55	$22.86	$8.25	$6.16	$0.00	$37.27
3	60	$24.94	$8.25	$6.72	$0.00	$39.91
4	65	$27.01	$8.25	$7.28	$0.00	$42.54
5	70	$29.09	$8.25	$19.39	$0.00	$56.73
6	75	$31.17	$8.25	$19.95	$0.00	$59.37
7	80	$33.25	$8.25	$20.51	$0.00	$62.01
8	90	$37.40	$8.25	$21.63	$0.00	$67.28

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

PAINTER / TAPER (BRUSH, REPAINT) *PAINTERS LOCAL 35 - ZONE 2*	01/01/2021	$39.62	$8.25	$22.75	$0.00	$70.62

Apprentice - *PAINTER Local 35 Zone 2 - BRUSH REPAINT*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$19.81	$8.25	$0.00	$0.00	$28.06
2	55	$21.79	$8.25	$6.16	$0.00	$36.20
3	60	$23.77	$8.25	$6.72	$0.00	$38.74
4	65	$25.75	$8.25	$7.28	$0.00	$41.28
5	70	$27.73	$8.25	$19.39	$0.00	$55.37
6	75	$29.72	$8.25	$19.95	$0.00	$57.92
7	80	$31.70	$8.25	$20.51	$0.00	$60.46
8	90	$35.66	$8.25	$21.63	$0.00	$65.54

Notes:

Steps are 750 hrs.

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PAINTER TRAFFIC MARKINGS (HEAVY/HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.66	$8.60	$16.06	$0.00	$59.32
	06/01/2021	$35.58	$8.60	$16.06	$0.00	$60.24
	12/01/2021	$36.49	$8.60	$16.06	$0.00	$61.15
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
PANEL & PICKUP TRUCKS DRIVER *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$36.08	$12.91	$14.82	$0.00	$63.81
	06/01/2021	$36.88	$12.91	$14.82	$0.00	$64.61
	08/01/2021	$36.88	$13.41	$14.82	$0.00	$65.11
	12/01/2021	$36.88	$13.41	$16.01	$0.00	$66.30
PIER AND DOCK CONSTRUCTOR (UNDERPINNING AND DECK) *PILE DRIVER LOCAL 56 (ZONE 1)* For apprentice rates see "Apprentice- PILE DRIVER"	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59
PILE DRIVER *PILE DRIVER LOCAL 56 (ZONE 1)*	08/01/2020	$49.07	$9.40	$23.12	$0.00	$81.59

Apprentice - *PILE DRIVER - Local 56 Zone 1*

Effective Date - 08/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.54	$9.40	$23.12	$0.00	$57.06
2	60	$29.44	$9.40	$23.12	$0.00	$61.96
3	70	$34.35	$9.40	$23.12	$0.00	$66.87
4	75	$36.80	$9.40	$23.12	$0.00	$69.32
5	80	$39.26	$9.40	$23.12	$0.00	$71.78
6	80	$39.26	$9.40	$23.12	$0.00	$71.78
7	90	$44.16	$9.40	$23.12	$0.00	$76.68
8	90	$44.16	$9.40	$23.12	$0.00	$76.68

Notes:

% Indentured After 10/1/17; 45/45/55/55/70/70/80/80
Step 1&2 $34.01/ 3&4 $41.46/ 5&6 $62.80/ 7&8 $69.25

Apprentice to Journeyworker Ratio:1:5

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPEFITTER & STEAMFITTER *PIPEFITTERS LOCAL 537*	09/01/2020	$56.44	$11.70	$20.24	$0.00	$88.38
	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88

Apprentice - *PIPEFITTER - Local 537*

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$22.58	$11.70	$8.25	$0.00	$42.53
2	45	$25.40	$11.70	$20.24	$0.00	$57.34
3	60	$33.86	$11.70	$20.24	$0.00	$65.80
4	70	$39.51	$11.70	$20.24	$0.00	$71.45
5	80	$45.15	$11.70	$20.24	$0.00	$77.09

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	40	$23.18	$11.70	$8.25	$0.00	$43.13
2	45	$26.07	$11.70	$20.24	$0.00	$58.01
3	60	$34.76	$11.70	$20.24	$0.00	$66.70
4	70	$40.56	$11.70	$20.24	$0.00	$72.50
5	80	$46.35	$11.70	$20.24	$0.00	$78.29

Notes:

** 1:3; 3:15; 1:10 thereafter / Steps are 1 yr.
Refrig/AC Mechanic **1:1;1:2;2:4;3:6;4:8;5:10;6:12;7:14;8:17;9:20;10:23(Max)

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95

For apprentice rates see "Apprentice- LABORER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PIPELAYER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40

For apprentice rates see "Apprentice- LABORER (Heavy and Highway)

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PLUMBERS & GASFITTERS *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2020	$58.69	$13.57	$17.26	$0.00	$89.52
	03/01/2021	$60.19	$13.57	$17.26	$0.00	$91.02

Apprentice - *PLUMBER/GASFITTER - Local 12*

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$20.54	$13.57	$6.24	$0.00	$40.35
2	40	$23.48	$13.57	$7.08	$0.00	$44.13
3	55	$32.28	$13.57	$9.63	$0.00	$55.48
4	65	$38.15	$13.57	$11.33	$0.00	$63.05
5	75	$44.02	$13.57	$13.03	$0.00	$70.62

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$21.07	$13.57	$6.24	$0.00	$40.88
2	40	$24.08	$13.57	$7.08	$0.00	$44.73
3	55	$33.10	$13.57	$9.63	$0.00	$56.30
4	65	$39.12	$13.57	$11.33	$0.00	$64.02
5	75	$45.14	$13.57	$13.03	$0.00	$71.74

Notes:

** 1:2; 2:6; 3:10; 4:14; 5:19/Steps are 1 yr
Step4 with lic$66.82, Step5 with lic$74.39

Apprentice to Journeyworker Ratio:**

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC CONTROLS (TEMP.) *PIPEFITTERS LOCAL 537*	09/01/2020	$56.44	$11.70	$20.24	$0.00	$88.38
	03/01/2021	$57.94	$11.70	$20.24	$0.00	$89.88

For apprentice rates see "Apprentice- PIPEFITTER" or "PLUMBER/PIPEFITTER"

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
PNEUMATIC DRILL/TOOL OPERATOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
For apprentice rates see "Apprentice- LABORER"						
PNEUMATIC DRILL/TOOL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWDERMAN & BLASTER *LABORERS - ZONE 2*	12/01/2020	$35.66	$8.60	$16.06	$0.00	$60.32
	06/01/2021	$36.58	$8.60	$16.06	$0.00	$61.24
	12/01/2021	$37.49	$8.60	$16.06	$0.00	$62.15
	06/01/2022	$38.39	$8.60	$16.06	$0.00	$63.05
	12/01/2022	$39.24	$8.60	$16.06	$0.00	$63.90
	06/01/2023	$40.14	$8.60	$16.06	$0.00	$64.80
	12/01/2023	$41.04	$8.60	$16.06	$0.00	$65.70
For apprentice rates see "Apprentice- LABORER"						
POWDERMAN & BLASTER (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$35.66	$8.60	$16.06	$0.00	$60.32
	06/01/2021	$36.58	$8.60	$16.06	$0.00	$61.24
	12/01/2021	$37.49	$8.60	$16.06	$0.00	$62.15
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)"						
POWER SHOVEL/DERRICK/TRENCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.98	$13.50	$15.70	$0.00	$79.18
	06/01/2021	$51.08	$13.50	$15.70	$0.00	$80.28
	12/01/2021	$52.23	$13.50	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (CONCRETE) *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.98	$13.50	$15.70	$0.00	$79.18
	06/01/2021	$51.08	$13.50	$15.70	$0.00	$80.28
	12/01/2021	$52.23	$13.50	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
PUMP OPERATOR (DEWATERING, OTHER) *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$33.00	$13.50	$15.70	$0.00	$62.20
	06/01/2021	$33.75	$13.50	$15.70	$0.00	$62.95
	12/01/2021	$34.54	$13.50	$15.70	$0.00	$63.74
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
READY MIX CONCRETE DRIVERS after 4/30/12 (Drivers Hired After 4/30/2012)*TEAMSTERS 25 (Suburban) - Aggregate*	08/01/2020	$27.90	$10.91	$14.12	$0.00	$52.93
	05/01/2021	$29.15	$10.91	$15.25	$0.00	$55.31
	08/01/2021	$29.15	$11.41	$15.25	$0.00	$55.81
	05/01/2022	$30.40	$11.41	$15.25	$0.00	$57.06
	08/01/2022	$30.40	$11.91	$15.25	$0.00	$57.56
READY-MIX CONCRETE DRIVER *TEAMSTERS 25 (Suburban) - Aggregate*	08/01/2020	$29.00	$10.91	$14.12	$0.00	$54.03
	05/01/2021	$29.75	$10.91	$15.25	$0.00	$55.91
	08/01/2021	$29.75	$11.41	$15.25	$0.00	$56.41
	05/01/2022	$30.50	$11.41	$15.25	$0.00	$57.16
	08/01/2022	$30.50	$11.91	$15.25	$0.00	$57.66
RECLAIMERS *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						

Classification	**Effective Date**	**Base Wage**	**Health**	**Pension**	**Supplemental Unemployment**	**Total Rate**
RIDE-ON MOTORIZED BUGGY OPERATOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
ROLLER/SPREADER/MULCHING MACHINE *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
ROOFER (Inc.Roofer Waterproofng &Roofer Dampproofg) *ROOFERS LOCAL 33*	02/01/2021	$46.60	$12.18	$17.15	$0.00	$75.93
	08/01/2021	$48.03	$12.18	$17.15	$0.00	$77.36
	02/01/2022	$49.46	$12.18	$17.15	$0.00	$78.79

Apprentice - *ROOFER - Local 33*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$23.30	$12.18	$4.31	$0.00	$39.79
2	60	$27.96	$12.18	$17.15	$0.00	$57.29
3	65	$30.29	$12.18	$17.15	$0.00	$59.62
4	75	$34.95	$12.18	$17.15	$0.00	$64.28
5	85	$39.61	$12.18	$17.15	$0.00	$68.94

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$24.02	$12.18	$4.31	$0.00	$40.51
2	60	$28.82	$12.18	$17.15	$0.00	$58.15
3	65	$31.22	$12.18	$17.15	$0.00	$60.55
4	75	$36.02	$12.18	$17.15	$0.00	$65.35
5	85	$40.83	$12.18	$17.15	$0.00	$70.16

Notes: ** 1:5, 2:6-10, the 1:10; Reroofing: 1:4, then 1:1
Step 1 is 2000 hrs.; Steps 2-5 are 1000 hrs.
(Hot Pitch Mechanics' receive $1.00 hr. above ROOFER)

Apprentice to Journeyworker Ratio:**

Classification	**Effective Date**	**Base Wage**	**Health**	**Pension**	**Supplemental Unemployment**	**Total Rate**
ROOFER SLATE / TILE / PRECAST CONCRETE *ROOFERS LOCAL 33*	02/01/2021	$46.85	$12.18	$17.15	$0.00	$76.18
	08/01/2021	$48.28	$12.18	$17.15	$0.00	$77.61
	02/01/2022	$49.71	$12.18	$17.15	$0.00	$79.04
For apprentice rates see "Apprentice- ROOFER"						
SHEETMETAL WORKER *SHEETMETAL WORKERS LOCAL 17 - A*	02/01/2021	$51.67	$13.65	$24.57	$2.70	$92.59
	08/01/2021	$53.42	$13.65	$24.57	$2.75	$94.39
	02/01/2022	$55.17	$13.65	$24.57	$2.80	$96.19

Apprentice - *SHEET METAL WORKER - Local 17-A*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$21.70	$13.65	$5.89	$0.00	$41.24
2	42	$21.70	$13.65	$5.89	$0.00	$41.24
3	47	$24.28	$13.65	$11.13	$1.48	$50.54
4	47	$24.28	$13.65	$11.13	$1.48	$50.54
5	52	$26.87	$13.65	$12.08	$1.58	$54.18
6	52	$26.87	$13.65	$12.33	$1.59	$54.44
7	60	$31.00	$13.65	$13.70	$1.76	$60.11
8	65	$33.59	$13.65	$14.65	$1.88	$63.77
9	75	$38.75	$13.65	$16.56	$2.08	$71.04
10	85	$43.92	$13.65	$17.96	$2.28	$77.81

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	42	$22.44	$13.65	$5.89	$0.00	$41.98
2	42	$22.44	$13.65	$5.89	$0.00	$41.98
3	47	$25.11	$13.65	$11.13	$1.48	$51.37
4	47	$25.11	$13.65	$11.13	$1.48	$51.37
5	52	$27.78	$13.65	$12.08	$1.58	$55.09
6	52	$27.78	$13.65	$12.33	$1.59	$55.35
7	60	$32.05	$13.65	$13.70	$1.76	$61.16
8	65	$34.72	$13.65	$14.65	$1.88	$64.90
9	75	$40.07	$13.65	$16.56	$2.08	$72.36
10	85	$45.41	$13.65	$17.96	$2.28	$79.30

Notes:

Steps are 6 mos.

Apprentice to Journeyworker Ratio:1:4

SPECIALIZED EARTH MOVING EQUIP < 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$36.54	$12.91	$14.82	$0.00	$64.27
	06/01/2021	$37.34	$12.91	$14.82	$0.00	$65.07
	08/01/2021	$37.34	$13.41	$14.82	$0.00	$65.57
	12/01/2021	$37.34	$13.41	$16.01	$0.00	$66.76
SPECIALIZED EARTH MOVING EQUIP > 35 TONS *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$36.83	$12.91	$14.82	$0.00	$64.56
	06/01/2021	$37.63	$12.91	$14.82	$0.00	$65.36
	08/01/2021	$37.63	$13.41	$14.82	$0.00	$65.86
	12/01/2021	$37.63	$13.41	$16.01	$0.00	$67.05
SPRINKLER FITTER *SPRINKLER FITTERS LOCAL 550 - (Section A) Zone 1*	01/01/2021	$61.45	$10.00	$20.75	$0.00	$92.20
	03/01/2021	$63.47	$10.00	$20.75	$0.00	$94.22

Apprentice - *SPRINKLER FITTER - Local 550 (Section A) Zone 1*

Effective Date - 01/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$21.51	$10.00	$11.81	$0.00	$43.32
2	40	$24.58	$10.00	$12.50	$0.00	$47.08
3	45	$27.65	$10.00	$13.19	$0.00	$50.84
4	50	$30.73	$10.00	$13.93	$0.00	$54.66
5	55	$33.80	$10.00	$14.56	$0.00	$58.36
6	60	$36.87	$10.00	$15.25	$0.00	$62.12
7	65	$39.94	$10.00	$15.94	$0.00	$65.88
8	70	$43.02	$10.00	$16.63	$0.00	$69.65
9	75	$46.09	$10.00	$17.31	$0.00	$73.40
10	80	$49.16	$10.00	$18.00	$0.00	$77.16

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	35	$22.21	$10.00	$11.81	$0.00	$44.02
2	40	$25.39	$10.00	$12.50	$0.00	$47.89
3	45	$28.56	$10.00	$13.19	$0.00	$51.75
4	50	$31.74	$10.00	$13.93	$0.00	$55.67
5	55	$34.91	$10.00	$14.56	$0.00	$59.47
6	60	$38.08	$10.00	$15.25	$0.00	$63.33
7	65	$41.26	$10.00	$15.94	$0.00	$67.20
8	70	$44.43	$10.00	$16.63	$0.00	$71.06
9	75	$47.60	$10.00	$17.31	$0.00	$74.91
10	80	$50.78	$10.00	$18.00	$0.00	$78.78

Notes: Apprentice entered prior 9/30/10:
40/45/50/55/60/65/70/75/80/85
Steps are 850 hours

Apprentice to Journeyworker Ratio:1:3

STEAM BOILER OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TAMPERS, SELF-PROPELLED OR TRACTOR DRAWN *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88

For apprentice rates see "Apprentice- OPERATING ENGINEERS"

TELECOMMUNICATION TECHNICIAN *ELECTRICIANS LOCAL 103*	09/01/2020	$40.84	$13.00	$17.53	$0.00	$71.37
	03/01/2021	$42.11	$13.00	$17.88	$0.00	$72.99
	09/01/2021	$43.77	$13.00	$18.00	$0.00	$74.77
	03/01/2022	$45.27	$13.00	$18.12	$0.00	$76.39
	09/01/2022	$46.99	$13.00	$18.24	$0.00	$78.23
	03/01/2023	$48.54	$13.00	$18.37	$0.00	$79.91

Apprentice - *TELECOMMUNICATION TECHNICIAN - Local 103*

Effective Date - 09/01/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$18.38	$13.00	$0.55	$0.00	$31.93
2	45	$18.38	$13.00	$0.55	$0.00	$31.93
3	50	$20.42	$13.00	$14.20	$0.00	$47.62
4	50	$20.42	$13.00	$14.20	$0.00	$47.62
5	55	$22.46	$13.00	$14.53	$0.00	$49.99
6	60	$24.50	$13.00	$14.87	$0.00	$52.37
7	65	$26.55	$13.00	$15.20	$0.00	$54.75
8	70	$28.59	$13.00	$15.53	$0.00	$57.12
9	75	$30.63	$13.00	$15.87	$0.00	$59.50
10	80	$32.67	$13.00	$16.20	$0.00	$61.87

Effective Date - 03/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	45	$18.95	$13.00	$0.57	$0.00	$32.52
2	45	$18.95	$13.00	$0.57	$0.00	$32.52
3	50	$21.06	$13.00	$14.47	$0.00	$48.53
4	50	$21.06	$13.00	$14.47	$0.00	$48.53
5	55	$23.16	$13.00	$14.80	$0.00	$50.96
6	60	$25.27	$13.00	$15.14	$0.00	$53.41
7	65	$27.37	$13.00	$15.47	$0.00	$55.84
8	70	$29.48	$13.00	$15.80	$0.00	$58.28
9	75	$31.58	$13.00	$16.15	$0.00	$60.73
10	80	$33.69	$13.00	$16.48	$0.00	$63.17

Notes:

Apprentice to Journeyworker Ratio:1:1

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TERRAZZO FINISHERS *BRICKLAYERS LOCAL 3 - MARBLE & TILE*	02/01/2021	$54.69	$11.39	$22.09	$0.00	$88.17
	08/01/2021	$56.09	$11.39	$22.25	$0.00	$89.73
	02/01/2022	$56.68	$11.39	$22.25	$0.00	$90.32

Apprentice - *TERRAZZO FINISHER - Local 3 Marble & Tile*

Effective Date - 02/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$27.35	$11.39	$22.09	$0.00	$60.83
2	60	$32.81	$11.39	$22.09	$0.00	$66.29
3	70	$38.28	$11.39	$22.09	$0.00	$71.76
4	80	$43.75	$11.39	$22.09	$0.00	$77.23
5	90	$49.22	$11.39	$22.09	$0.00	$82.70

Effective Date - 08/01/2021

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	50	$28.05	$11.39	$22.25	$0.00	$61.69
2	60	$33.65	$11.39	$22.25	$0.00	$67.29
3	70	$39.26	$11.39	$22.25	$0.00	$72.90
4	80	$44.87	$11.39	$22.25	$0.00	$78.51
5	90	$50.48	$11.39	$22.25	$0.00	$84.12

Notes:

Apprentice to Journeyworker Ratio:1:3

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TEST BORING DRILLER *LABORERS - FOUNDATION AND MARINE*	12/01/2020	$41.30	$8.60	$17.47	$0.00	$67.37
	06/01/2021	$42.32	$8.60	$17.47	$0.00	$68.39
	12/01/2021	$43.33	$8.60	$17.47	$0.00	$69.40
For apprentice rates see "Apprentice- LABORER"						
TEST BORING DRILLER HELPER *LABORERS - FOUNDATION AND MARINE*	12/01/2020	$40.02	$8.60	$17.47	$0.00	$66.09
	06/01/2021	$41.04	$8.60	$17.47	$0.00	$67.11
	12/01/2021	$42.05	$8.60	$17.47	$0.00	$68.12
For apprentice rates see "Apprentice- LABORER"						
TEST BORING LABORER *LABORERS - FOUNDATION AND MARINE*	12/01/2020	$39.90	$8.60	$17.47	$0.00	$65.97
	06/01/2021	$40.92	$8.60	$17.47	$0.00	$66.99
	12/01/2021	$41.93	$8.60	$17.47	$0.00	$68.00
For apprentice rates see "Apprentice- LABORER"						
TRACTORS/PORTABLE STEAM GENERATORS *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.45	$13.50	$15.70	$0.00	$78.65
	06/01/2021	$50.54	$13.50	$15.70	$0.00	$79.74
	12/01/2021	$51.68	$13.50	$15.70	$0.00	$80.88
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
TRAILERS FOR EARTH MOVING EQUIPMENT *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$37.12	$12.91	$14.82	$0.00	$64.85
	06/01/2021	$37.92	$12.91	$14.82	$0.00	$65.65
	08/01/2021	$37.92	$13.41	$14.82	$0.00	$66.15
	12/01/2021	$37.92	$13.41	$16.01	$0.00	$67.34
TUNNEL WORK - COMPRESSED AIR *LABORERS (COMPRESSED AIR)*	12/01/2020	$52.13	$8.60	$17.92	$0.00	$78.65
	06/01/2021	$53.15	$8.60	$17.92	$0.00	$79.67
	12/01/2021	$54.16	$8.60	$17.92	$0.00	$80.68
For apprentice rates see "Apprentice- LABORER"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TUNNEL WORK - COMPRESSED AIR (HAZ. WASTE) *LABORERS (COMPRESSED AIR)*	12/01/2020	$54.13	$8.60	$17.92	$0.00	$80.65
	06/01/2021	$55.15	$8.60	$17.92	$0.00	$81.67
	12/01/2021	$56.16	$8.60	$17.92	$0.00	$82.68
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR *LABORERS (FREE AIR TUNNEL)*	12/01/2020	$44.20	$8.60	$17.92	$0.00	$70.72
	06/01/2021	$45.22	$8.60	$17.92	$0.00	$71.74
	12/01/2021	$46.23	$8.60	$17.92	$0.00	$72.75
For apprentice rates see "Apprentice- LABORER"						
TUNNEL WORK - FREE AIR (HAZ. WASTE) *LABORERS (FREE AIR TUNNEL)*	12/01/2020	$46.20	$8.60	$17.92	$0.00	$72.72
	06/01/2021	$47.22	$8.60	$17.92	$0.00	$73.74
	12/01/2021	$48.23	$8.60	$17.92	$0.00	$74.75
For apprentice rates see "Apprentice- LABORER"						
VAC-HAUL *TEAMSTERS JOINT COUNCIL NO. 10 ZONE A*	12/01/2020	$36.54	$12.91	$14.82	$0.00	$64.27
	06/01/2021	$37.34	$12.91	$14.82	$0.00	$65.07
	08/01/2021	$37.34	$13.41	$14.82	$0.00	$65.57
	12/01/2021	$37.34	$13.41	$16.01	$0.00	$66.76
WAGON DRILL OPERATOR *LABORERS - ZONE 2*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
	06/01/2022	$37.64	$8.60	$16.06	$0.00	$62.30
	12/01/2022	$38.49	$8.60	$16.06	$0.00	$63.15
	06/01/2023	$39.39	$8.60	$16.06	$0.00	$64.05
	12/01/2023	$40.29	$8.60	$16.06	$0.00	$64.95
For apprentice rates see "Apprentice- LABORER"						
WAGON DRILL OPERATOR (HEAVY & HIGHWAY) *LABORERS - ZONE 2 (HEAVY & HIGHWAY)*	12/01/2020	$34.91	$8.60	$16.06	$0.00	$59.57
	06/01/2021	$35.83	$8.60	$16.06	$0.00	$60.49
	12/01/2021	$36.74	$8.60	$16.06	$0.00	$61.40
For apprentice rates see "Apprentice- LABORER (Heavy and Highway)						
WASTE WATER PUMP OPERATOR *OPERATING ENGINEERS LOCAL 4*	12/01/2020	$49.98	$13.50	$15.70	$0.00	$79.18
	06/01/2021	$51.08	$13.50	$15.70	$0.00	$80.28
	12/01/2021	$52.23	$13.50	$15.70	$0.00	$81.43
For apprentice rates see "Apprentice- OPERATING ENGINEERS"						
WATER METER INSTALLER *PLUMBERS & GASFITTERS LOCAL 12*	09/01/2020	$58.69	$13.57	$17.26	$0.00	$89.52
	03/01/2021	$60.19	$13.57	$17.26	$0.00	$91.02
For apprentice rates see "Apprentice- PLUMBER/PIPEFITTER" or "PLUMBER/GASFITTER"						
Outside Electrical - East						
CABLE TECHNICIAN (Power Zone) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$29.67	$9.25	$1.89	$0.00	$40.81
For apprentice rates see "Apprentice- LINEMAN"						
CABLEMAN (Underground Ducts & Cables) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$42.03	$9.25	$10.27	$0.00	$61.55
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN CDL *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$34.62	$9.25	$10.07	$0.00	$53.94
For apprentice rates see "Apprentice- LINEMAN"						
DRIVER / GROUNDMAN -Inexperienced (<2000 Hrs) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
For apprentice rates see "Apprentice- LINEMAN"						

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
EQUIPMENT OPERATOR (Class A CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$42.03	$9.25	$14.35	$0.00	$65.63
EQUIPMENT OPERATOR (Class B CDL) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$37.09	$9.25	$10.87	$0.00	$57.21
GROUNDMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$27.20	$9.25	$1.82	$0.00	$38.27
GROUNDMAN -Inexperienced (<2000 Hrs.) *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104* For apprentice rates see "Apprentice- LINEMAN"	08/30/2020	$22.25	$9.25	$1.82	$0.00	$33.32
JOURNEYMAN LINEMAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	08/30/2020	$49.45	$9.25	$17.48	$0.00	$76.18

Apprentice - *LINEMAN (Outside Electrical) - East Local 104*

Effective Date - 08/30/2020

Step	percent	Apprentice Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
1	60	$29.67	$9.25	$3.39	$0.00	$42.31
2	65	$32.14	$9.25	$3.46	$0.00	$44.85
3	70	$34.62	$9.25	$3.54	$0.00	$47.41
4	75	$37.09	$9.25	$5.11	$0.00	$51.45
5	80	$39.56	$9.25	$5.19	$0.00	$54.00
6	85	$42.03	$9.25	$5.26	$0.00	$56.54
7	90	$44.51	$9.25	$7.34	$0.00	$61.10

Notes:

Apprentice to Journeyworker Ratio:1:2

Classification	Effective Date	Base Wage	Health	Pension	Supplemental Unemployment	Total Rate
TELEDATA CABLE SPLICER *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$30.73	$4.70	$3.17	$0.00	$38.60
TELEDATA LINEMAN/EQUIPMENT OPERATOR *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77
TELEDATA WIREMAN/INSTALLER/TECHNICIAN *OUTSIDE ELECTRICAL WORKERS - EAST LOCAL 104*	02/04/2019	$28.93	$4.70	$3.14	$0.00	$36.77

Additional Apprentice Information:

Minimum wage rates for apprentices employed on public works projects are listed above as a percentage of the pre-determined hourly wage rate established by the Commissioner under the provisions of the M.G.L. c. 149, ss. 26-27D. Apprentice ratios are established by the Division of Apprenticeship Training pursuant to M.G.L. c. 23, ss. 11E-11L.

All apprentices must be registered with the Division of Apprenticeship Training in accordance with M.G.L. c. 23, ss. 11E-11L.

All steps are six months (1000 hours.)
Ratios are expressed in allowable number of apprentices to journeymen or fraction thereof, unless otherwise specified.

** Multiple ratios are listed in the comment field.
*** APP to JM; 1:1, 2:2, 2:3, 3:4, 4:4, 4:5, 4:6, 5:7, 6:7, 6:8, 6:9, 7:10, 8:10, 8:11, 8:12, 9:13, 10:13, 10:14, etc.
**** APP to JM; 1:1, 1:2, 2:3, 2:4, 3:5, 4:6, 4:7, 5:8, 6:9, 6:10, 7:11, 8:12, 8:13, 9:14, 10:15, 10:16, etc.

LOCATION AND SCOPE OF WORK
LEXINGTON TOWN CENTER
TRAFFIC AND STREETSCAPE IMPROVEMENTS CONTRACT #21-33

1. DESCRIPTION OF THE PROJECT

The Work consists of, but is not limited to, the roadway and streetscape improvements along Massachusetts Avenue (Route 4 & 225) between Meriam Street and Cary Hall Entrance (Sta. 29 +25) and work along Waltham Street to Vine Brook Road and also sidewlk improvements at Cary Hall. The project is located in the Center of Lexington and includes an overall distance of approximately 1900 feet on Massachusetts Avenue and 400 feet on Waltham Street. The work for this project includes, but is not limited to, full depth construction, grading, and/or relocating sections of the existing roadway, earth excavation, installation of drains, adjusting/ rebuilding drainage, sewer, and water structures, installation of bituminous concrete pavement, bituminous concrete berm, granite curbing and edging, handicap ramps, sidewalk installation and replacement, landscaping, and other miscellaneous work.

2. LOCATION OF PROJECT

The work is to be performed in various areas in the Town of Lexington including, but not limited to, locations as shown in Subsection 3, Scope of Work.

3. SCOPE OF WORK

The work will consist of areas of full depth pavement reconstruction, milling and overly, brick sidewalks and cement concrete sidewalks with brick accent bands, planter seat benches, street furnishings, bike racks, wheelchair ramps, removing and resetting of curb, installation of new granite curb, drainage improvements, miscellaneous water work, installation of new ornamental light system with load centers and service connections, loaming and seeding, inground irrigation system, plantings and various streetscape amenities, signal equipment upgrade at Waltham Street intersection, installing automated parking pay station units, signing and pavement markings and other various items to complete the roadway and streetscape improvements in the Town of Lexington, and all incidental work necessary to complete the work as shown on the plans or described herein.

All work done under this contract shall be in conformance with the Commonwealth of Massachusetts Department of Transportation 2020 **STANDARD SPECIFICATIONS FOR HIGHWAYS AND BRIDGES, ALL SUPPLEMENTAL SPECIFICATIONS INCLUDING DVISION I, AND II OF TOWN OF LEXINGTON** , BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI 318-89) OR LATER, THE MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES 2009 EDITION, THE DECEMBER 2016 MASSDOT CONSTRUCTION STANDARD DETAILS, , THE AMERICAN WATER WORKS ASSOCIATION STANDARD FOR THE INSTALLATION OF DUCTILE-IRON WATER MAINS AND THEIR APPURTENANCES, THE 1990 STANDARD DRAWINGS FOR SIGNS AND SUPPORTS, THE LATEST PUBLIC RIGHTS OF WAY GUIDELINES FOR PEDESTRIAN FACILITIES (PROWAG), the **PLANS** and these **SPECIAL PROVISIONS**.

PROPOSAL TO
TOWN OF LEXINGTON, MASSACHUSETTS

LEXINGTON TOWN CENTER
TRAFFIC AND STREETSCAPE IMPROVEMENTS
CONTRACT #21-33

The undersigned certifies under penalties of perjury that this bid or proposal has been made and submitted in good faith and without collusion or fraud with any other person. As used in this certification, the word "person" shall mean any natural person, business, partnership, corporation, union, committee, club, or other organization, entity, or group of individuals. The undersigned further certifies that the only persons or parties interested in this proposal as principals are as stated, that he/she has carefully examined the Information for Bidders, Contract, Specifications, Contract Drawings, all as prepared by the office of the Town Engineer; that he/she has informed himself/herself fully in regard to all conditions pertaining to the work and the place where it is to be done, and from them the undersigned makes this Proposal. These prices shall cover all expenses incurred in performing the work required under the Contract Documents, of which this proposal is a part.

If written notice of the acceptance of this bid is mailed, or otherwise delivered to the undersigned within 30 days, excluding Saturdays, Sundays, and legal holidays, after the date of opening the bid, the undersigned will within five days, excluding Saturdays, Sundays, and legal holidays, after the date of such notification, execute and deliver a Contract in the form attached thereto, together with a performance bond, and payment bond, each of a surety company qualified to do business under the laws of the State and furnished by a company satisfactory to the Town. The premiums for these bonds shall be paid by the General Contractor and shall be included in the Contract price. The Undersigned further agrees that the bid security accompanying this Proposal shall become the property of the Town, if the bidder fails to execute the Contract as stated above.

The undersigned hereby agrees to commence work under this Contract within 20 working days of the execution of the Contract. The bidder acknowledges receipt of the following addenda numbered:

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In accordance with the above understanding, the undersigned proposes to do all of the work, furnish all of the materials, and complete the work in its entirety in the manner and under the conditions required at the prices listed as follows:

The Bid Form for this contract consists of Part A. – BASE BID, and Part B. – ADDITIVE BID #1.

ADDITIVE BID #1 shall consist of the following:

1. **Add Items 832 and 847.2 for Parking Pay Station signage**
2. **Add Item 875.11 Parking Pay Station-Exclude Cost of Pay Station**
3. **Add Item 875.2 Parking Meter Post Removed and Stacked (47 posts)**
4. **Deduct a deduction in Item 875.1 Parking Meter Post Removed and Reset (47 posts) from BASE BID.**

Part A. - BASE BID
Bidder agrees to perform all the work of the BASE BID described in the Contract Documents and Bid Form at the unit price(s)/lump sum(s) as stated in the Bid Form for a total amount of

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($ _______________________________)

Part B. - ADDITIVE BID #1
Bidder agrees to perform all the work of the ADDITIVE BID #1 described in the Contract Documents and Bid Form at the unit price(s)/lump sum(s) as stated in the Bid Form for a total amount of

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($ _______________________________)

SUM of BASE and ADDITIVE BIDS

Bidder agrees to perform all the work of the BASE BID, and the ADDITIVE BID # (sum of totals for each) described in the Contract Documents and Bid Form at the unit price(s)/lump sum(s) as stated in the Bid Form for a total amount of

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($ _______________________________)

All prices, except at the extended totals, shall be stated in both words and figures. In the event of a discrepancy between the price in words and the price in figures, the written word shall govern. In the event of a discrepancy between mathematical totals and the totals stated, the mathematical totals shall govern. **Where a work item is listed under both the BASE BID and the ADDITIVE BID, the same unit price shall be used in both cases.**

All prices shall be typewritten or written by hand (printed) in black ink.

The Town reserves the right to accept or reject the ADDITIVE BID and to determine the lowest responsible and eligible bidder on the basis of the BASE BID or the sum of the BASE BID and the ADDITIVE BID. The low bidder for purpose of award shall be the lowest amount for the BASE BID and/or the BASE BID plus the accepted ADDITIVE BID within the funds available.

Part A. BASE BID ITEMS

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
101.01	1	SITE PREPARATION At Per Lump Sum				
103.	21	TREE REMOVED - DIAMETER UNDER 24 INCHES At Per Each				
120.1	5,300	UNCLASSIFIED EXCAVATION At Per Cubic Yard				
121.	20	CLASS A ROCK EXCAVATION At Per Cubic Yard				
141.1	300	TEST PIT FOR EXPLORATION At Per Cubic Yard				
144.	20	CLASS B ROCK EXCAVATION At Per Cubic Yard				
151.	3,100	GRAVEL BORROW At Per Cubic Yard				
153.	250	CONTROLLED DENSITY FILL - EXCAVATABLE At Per Cubic Yard				
170.	1,750	FINE GRADING AND COMPACTING - SUBGRADE AREA At Per Square Yard				
201.	23	CATCH BASIN At Per Each				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
202.	10	MANHOLE At Per Each				
204.11	3	GUTTER INLET - SPECIAL At Per Each				
220.11	85	STRUCTURE ADJUSTED At Per Each				
220.21	20	STRUCTURE REBUILT At Per Foot				
220.3	7	DRAINAGE STRUCTURE CHANGE IN TYPE At Per Each				
220.51	8	STRUCTURE REMODELED At Per Each				
222.3	60	FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD At Per Each				
227.4	10	MASONRY PLUG At Per Square Foot				
238.08	15	8 INCH DUCTILE IRON PIPE At Per Foot				
238.10	600	10 INCH DUCTILE IRON PIPE At Per Foot				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
241.12	270	12 INCH REINFORCED CONCRETE PIPE At Per Foot				
272.	80	PIPE REMOVED AND DISPOSED At Per Foot				
303.06	30	6 INCH DUCTILE IRON WATER PIPE (MECHANICAL JOINT) At Per Foot				
347.	100	SERVICE PIPE - COPPER At Per Foot				
357.	15	GATE BOX At Per Each				
358.	60	GATE BOX ADJUSTED At Per Each				
376.2	2	HYDRANT - REMOVED AND RESET At Per Each				
376.21	4	HYDRANT - REMOVED AND REPLACED At Per Each				
390.01	500	IRRIGATION SYSTEM MODIFIED At Per Foot				
390.1	600	4 INCH PERF CORRUGATED PIPE At Per Foot				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
390.2	25	12 INCH PVC PIPE WITH SQUARE GRATE At Per Each				
390.3	1	IRRIGATION SYSTEM At Per Lump Sum				
402.1	350	DENSE GRADED CRUSHED STONE FOR SUB-BASE At Per Ton				
415.2	13,500	PAVEMENT FINE MILLING At Per Square Yard				
440.	15,000	CALCIUM CHLORIDE FOR ROADWAY DUST CONTROL At Per Pound				
443.	10	WATER FOR ROADWAY DUST CONTROL At Per Megagallon				
450.23	1,500	SUPERPAVE SURFACE COURSE - 12.5 (SSC - 12.5) At Per Ton				
450.31	600	SUPERPAVE INTERMEDIATE COURSE - 12.5 (SIC - 12.5) At Per Ton				
450.42	500	SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5) At Per Ton				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
450.53	80	SUPERPAVE LEVELING COURSE - 12.5 (SLC - 12.5) At Per Ton				
451.	200	HMA FOR PATCHING At Per Ton				
452.	1,100	ASPHALT EMULSION FOR TACK COAT At Per Gallon				
453.	10,000	HMA JOINT SEALANT At Per Foot				
472.	900	TEMPORARY ASPHALT PATCHING At Per Ton				
504.01	2,000	GRANITE CURB TYPE VA-4 At Per Foot				
520.13	90	SLOPED CONCRETE CURB At Per Foot				
580.	2,900	CURB REMOVED AND RESET At Per Foot				
580.2	360	SAND BLAST EXISTNG CURB At Per Foot				
598.1	800	REMOVE AND RESET GRANITE CURB FOR PLANTERS At Per Foot				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
598.2	1,000	GRANITE CURB FOR TREE AND SHRUB PLANTERS At Per Foot				
598.5	120	GRANITE BLOCK At Per Foot				
598.51	110	WOOD SEAT AT BENCH PLANTER At Per Foot				
697.1	200	COMPOST SOCK At Per Foot				
697.2	55	SILT SACK At Per Each				
701.	1,300	CEMENT CONCRETE SIDEWALK At Per Square Yard				
701.1	250	CEMENT CONCRETE SIDEWALK AT DRIVEWAYS At Per Square Yard				
701.2	430	CEMENT CONCRETE WHEELCHAIR RAMP At Per Square Yard				
702.	50	HOT MIX ASPHALT SIDEWALK OR DRIVEWAY At Per Ton				
706.01	5,100	BRICK PAVERS FOR SIDEWALKS At Per Square Yard				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
706.02	100	BRICK PAVERS FOR DRIVEWAYS At Per Square Yard				
706.03	100	BRICK PAVERS FOR WHEELCHAIR RAMP At Per Square Yard				
706.31	35	BRICK/PAVER SURFACE REMOVED & RELAID At Per Square Yard				
706.51	35	COBBLESTONE REMOVED & RELAID At Per Square Yard				
707.11	50	R&R EXISTING WOOD BENCH At Per Each				
707.12	10	WOOD BENCH- TYPE B1 At Per Each				
707.13	4	WOOD BENCH- TYPE B2 At Per Each				
707.14	7	WOOD CHAIR At Per Each				
707.15	4	CAROUSEL TABLE AND SEATS At Per Each				
707.21	17	TRASH RECEPTACLE At Per Each				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
707.22	4	BIG BELLY TRASH AND RECYCLING At Per Each				
707.31	24	METAL TREE GRATE- TYPE A At Per Each				
707.32	10	METAL TREE GRATE- TYPE B At Per Each				
707.81	2	BOLLARD REMOVED AND RESET At Per Each				
707.91	17	BIKE RACK- TYPE A At Per Each				
707.92	11	BIKE RACK- TYPE B At Per Each				
708.1	30	WOOD PLANTER At Per Each				
708.2	1	CELL PHONE CHARGING STATION WITH ACCENT LIGHT At Per Each				
709.1	920	MODULAR SOIL CELLS At Per Square Yard				
711.	2	BOUND REMOVED AND RESET At Per Each				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
718.2	80	FLAG POLE HOLDERS IN SIDEWALK At Per Each				
745.3	1	WOODSHED REMOVED AND RELOCATED At Per Lump Sum				
748.	1	MOBILIZATION At Per Lump Sum				
751.	50	LOAM BORROW At Per Cubic Yard				
756.	1	NPDES STORMWATER POLLUTION PREVENTION PLAN At Per Lump Sum				
761.1	600	SOIL MIX- A At Per Cubic Yard				
761.2	310	SOIL MIX- B At Per Cubic Yard				
761.3	800	SOIL MIX- C At Per Cubic Yard				
765.	280	SEEDING At Per Square Yard				
775.1	90	TREES At Per Each				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
785.1	91	SHRUBS At Per Each				
795.1	170	PERENNIALS, ORNAMENTAL GRASSES & FERNS-1 GALLON At Per Each				
795.2	255	PERENNIALS, ORNAMENTAL GRASSES & FERNS-2 GALLON At Per Each				
804.1	220	1 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL) At Per Foot				
804.2	3,000	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) At Per Foot				
804.22	560	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (DOUBLE) At Per Foot				
804.23	500	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (3 BANK) At Per Foot				
804.24	900	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (4 BANK) At Per Foot				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
804.25	300	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (5 BANK) At Per Foot				
804.28	150	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (8 BANK) At Per Foot				
804.212	200	2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (12 BANK) At Per Foot				
804.3	3,750	3 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL) At Per Foot				
811.23	3	ELECTRIC HANDHOLE - SD2.023 At Per Each				
811.31	3	PULL BOX 12 X 12 INCHES - SD2.031 At Per Each				
811.37	4	HANDHOLE ADJUSTED At Per Each				
811.91	6	HANDHOLE TYPE A (STREET LIGHTING) At Per Each				
811.92	61	HANDHOLE TYPE B (STREET LIGHTING) At Per Each				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
814.1	34	POWER GROUND BOX At Per Each				
814.2	13	GFCI BOX ON RIGID CONDUIT At Per Each				
816.01	1	TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO. 1 At Per Lump Sum				
820.15	2	STREET LIGHT LOAD CENTER At Per Each				
823.71	8	LIGHT POLE AND LUMINAIRE REMOVED AND STACKED At Per Each				
823.94	35	LIGHTING FIXTURE - TYPE A 70W - 14 FOOT POST TOP At Per Each				
823.95	11	LIGHTING FIXTURE - TYPE B 160W - 26 FOOT POLE At Per Each				
823.96	8	LIGHTING FIXTURE - TYPE C 160W - 26 FOOT POLE WITH FLOOD LIGHT At Per Each				
823.97	3	LIGHTING FIXTURE - TYPE D 110W - 26 FOOT POLE At Per Each				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
823.98	11	LIGHTING FIXTURE - TYPE E ON UTILITY POLE At Per Each				
823.99	2	LIGHTING FIXTURE - TYPE F – LUMINAIRE ONLY At Per Each				
825.05	2	LIGHT POST REMOVED AND RESET At Per Each				
825.06	5	LIGHT POST REMOVED AND REPLACED At Per Each				
832.	170	WARNING-REGULATORY AND ROUTE MARKER - ALUMINUM PANEL (TYPE A) At Per Square Foot				
847.2	36	SIGN SUPPORT - 2 INCH ALUMINIUM At Per Each				
847.3	1	SIGN SUPPORT - 3 INCH IRON At Per Each				
852.	700	SAFETY SIGNING FOR TRAFFIC MANAGEMENT At Per Square Foot				
852.11	200	TEMPORARY PEDESTRIAN BARRICADE At Per Foot				
852.12	4	TEMPORARY PEDESTRIAN CURB RAMP At Per Each				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
853.1	4	PORTABLE BREAKAWAY BARRICADE TYPE III At Per Each				
854.1	200	PAVEMENT MARKING REMOVAL At Per Square Foot				
854.01	12,000	TEMPORARY PAVING MARKINGS 4 INCH (PAINTED) At Per Foot				
854.02	2,300	TEMPORARY PAVING MARKINGS 4 INCH (TAPE) At Per Foot				
856.	480	ARROW BOARD At Per Day				
856.12	550	PORTABLE CHANGEABLE MESSAGE SIGN At Per Day				
859.	17,000	REFLECTORIZED DRUM At Per Day				
860.991	1	TEMPORARY SIDEWALK BRIDGE At Per Lump Sum				
864.07	800	PAVEMENT ARROW AND LEGENDS (EPOXY) At Per Square Foot				
868.012	3,800	12-INCH REFLECTORIZED PAVEMENT MARKING LINES, EPOXY RESIN At Per Foot				

BASE BID ITEMS (Continued)

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
868.041	11,000	4-INCH REFLECTORIZED PAVEMENT MARKING LINES, EPOXY RESIN At Per Foot				
874.	14	STREET NAME SIGN At Per Each				
874.51	1	MISCELLANEOUS SIGNS REMOVED, DISCARDED, STACKED, OR RESET At Per Lump Sum				
875.1	62	PARKING METER POST REMOVED AND RESET At Per Each				
999.	13,000	POLICE DETAIL At Per Hour	52	00	676,000	00

Total Base Bid: **$** ______________________

Part B. ADDITIVE BID #1 ITEMS

ADDED ITEMS

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
832.	25	WARNING-REGULATORY AND ROUTE MARKER - ALUMINUM PANEL (TYPE A) At Per Square Foot				
847.2	14	SIGN SUPPORT - 2 INCH ALUMINIUM At Per Each				
875.11	14	PARKING PAY STATION - EXCLUDE COST OF PAY STATION At Per Each				
875.2	47	PARKING METER POST REMOVED AND STACKED At Per Each				

Subtotal (A): $ ____________________

REMOVED ITEMS

Item No.	Approx. Qty.	Item Description	Unit Price		Amount	
			Dollars	Cents	Dollars	Cents
875.1	(47)	PARKING METER POST REMOVED AND RESET At Per Each				

Subtotal (B): $ ____________________

Total Additive Bid #1 (A-B): $ ____________________

Note: Total Additive Bid #1 should be the difference of Subtotal (A) and Subtotal (B).

I certify under the penalties of perjury that I, to my best knowledge and belief, have filed all state tax returns and paid all state taxes required under law.

____

Signature of Individual* By: Corporate Office or
Corporate Name (Mandatory, if Applicable)
(Mandatory)

____

Social Security # ** (Voluntary) or Federal
Identification Number

* Approval of a contract or other agreement will not be granted unless this certification clause is signed by the applicant.

** Your social security number will be furnished to the Massachusetts Department of Revenue to determine whether you have met tax filing or tax payment obligations. Bidders who fail to correct their non-filing or delinquency will not have a contract or other agreement issued, renewed, or extended. This request is made under the authority of Mass. G.L. c. 62C s. 49A.

TOWN OF LEXINGTON

LEXINGTON TOWN CENTER
TRAFFIC AND STREETSCAPE IMPROVEMENTS
CONTRACT #21-33

THIS AGREEMENT, made the _______day of ___________________________, 20____, by and between the Town of Lexington, Massachusetts acting through its Town Manager, hereinafter called the Town and

____

____

____

with legal address and principal place of business at

____

____

____

hereinafter called the Contractor.

WITNESSETH: That for and in consideration of the payments and agreements hereinafter mentioned, to be made and performed by the Town, the Contractor hereby agrees with the Town to commence LEXINGTON TOWN CENTER CONTRACT #21-33, hereinafter called the project, for the consideration set forth in the proposal and all extra work in connection therewith, under the terms as stated in the conditions of the contract; and at his/her own proper cost and expense to furnish all materials, supplies, machinery, equipment, tools, superintendence, labor, insurance, and other accessories and services necessary to complete the said project in accordance with the conditions and prices stated in the proposal, the specifications, and drawings prepared therefor and as enumerated on the table of contents sheet, all of which are made a part hereof and collectively evidence and constitute the contract.

The Contractor hereby agrees to commence work under this contract within ten working days of the execution of this contract and to fully complete the project within the time specified in section 0200 of these contract documents.

The Town agrees to pay the Contractor for the performance of the Contract, subject to additions and deductions; and to make Payments on account thereof as provided in the Specifications of the contract.

WITNESS WHEREOF: the parties to these presents have executed this Contract in the year and day first above mentioned.

BY: ________________________________
James Malloy, Town Manager
for the Town of Lexington, MA

CONTRACTOR:

BY: ________________________________

____

As required by Chapter 693 of the Acts of 1964, this is to certify that the Town has an appropriation which is adequate to cover the cost of the contract.

____
Date Signed

____
Town Accountant

The Certificate shall be signed by the Auditor or Accountant or other Officer of the Town of Lexington, Massachusetts having similar duties and the Official Title noted below the Signature.

Note: If the Bidder to whom the Contract is awarded is a Corporation, a Certificate of Vote giving the officer the right to sign the Contract must accompany the executed Contract. The form on page 0600-3 can be used for this purpose.

CERTIFICATE OF VOTE

(Corporations Only)

At a duly authorized meeting of the Board of Directors of the ______________________________
Name of corporation

______________________________ held on _________________it was VOTED, That
Date

______________________________ ________________________________
Name Officer

of this company, be and hereby is authorized to execute contracts and bonds in the name and on behalf of said company, and affix its corporate seal hereto; and such execution of any contract or obligation in this company's name on its behalf by such officer under seal of the company, shall be valid and binding upon this company.

I hereby certify that I am the clerk of the above named corporation and that

________________________________ is the duly elected officer as above of said company, and that the above vote has not been amended or rescinded and remains in full force and effect as the date of this contract.

__________________ ____________________________
Date Clerk

Corporate Seal

PERFORMANCE BOND

KNOW ALL MEN BY THESE PRESENTS, That____

having a usual place of business in ____

As PRINCIPAL, and ____

a corporation duly organized and existing under the laws of _______________________________________

and authorized to do business in the Commonwealth of Massachusetts as SURETY, are hereby held and firmly bound unto the Town of Lexington, Massachusetts in the sum of ____

($_________________) to be paid the said Town of Lexington, Massachusetts for which payment, well and truly to be made, we hereby bind ourselves, jointly and severally, firmly by these presents.

WHEREAS, The said principal has made a contract with the said Town of Lexington, Massachusetts bearing date _______day of ________________________, 20____, in accordance with drawings and specifications prepared therefor, which contract is hereto annexed, the terms of which are herein referred to and hereby made a part of these presents; and

WHEREAS, The said surety has examined the said contract, its agreements, terms, covenants and conditions, and the plans referred to herein, and assents thereto.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH, That if the above bounden, its heirs, executors, administrators, successors and assigns, shall in all things stand to and abide by, and well and truly keep and perform, the covenants, conditions, and agreements in the said contract and any alterations thereof made as therein provided, on its or their part to be kept and performed at the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify its officers and agents, as therein stipulated.

Then this obligation shall become and be null and void; otherwise it shall be and remain in full force and virtue.

AND the said surety for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work performed thereunder or the specifications accompanying the same shall in anywise affect its obligations on this bond and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

IN WITNESS WHEREOF, The principal has caused these presents to be signed in its name and behalf and its corporate seal to be here to affixed by ______________________________

its _____________________________, and____________________________________

its _____________________________, thereto duly authorized, and the said surety has caused these presents to be signed in its name and behalf and its corporate seal to be hereto affixed by ...

____

its _____________________________, and___________________________________

its _____________________________, thereto duly authorized at

______________________________, on this _______ day of ____________________

two thousand and ____________________.

PRINCIPAL	SURETY
_________________________________(Seal)	_________________________________(Seal)
_________________________________(Seal)	_________________________________(Seal)
_____________________________________	_____________________________________

Signed and sealed in the presence of

____

PAYMENT BOND

KNOW ALL MEN BY THESE PRESENTS, That ___________________________________

having a usual place of business in ____

As PRINCIPAL, and ____

a corporation duly organized and existing under the laws of ___________________________ and authorized to do business in the Commonwealth of Massachusetts as SURETY, are hereby held and firmly bound unto the Town of Lexington, Massachusetts in the sum of ______________

____________________________________($______________________) to be paid the said

Town of Lexington, Massachusetts for which payment, well and truly to be made, we hereby bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

WHEREAS, The said principal has made a contract with the said Town of Lexington, Massachusetts bearing date ____________day of _____________________________, 20_____, for the completion of _______________________________ in accordance with drawings and specifications prepared therefor, which contract is hereto annexed, the terms of which are herein referred to and hereby made a part of these presents; and

WHEREAS, The said surety has examined the said contract, its agreements, terms, covenants and conditions, and the plans referred to herein, and assents thereto.

NOW THE CONDITION OF THIS OBLIGATION IS SUCH That if the above bounden, its heirs, executors, administrators, successors and assigns, shall pay for all labor performed or furnished, for all materials used or employed in the work and for the rental of appliances and equipment employed in the carrying out of said contract, and shall indemnify and save harmless the said Town of Lexington, Massachusetts its officers and agents as therein stipulated.

Then this obligation shall become and be null and void; otherwise it shall be and remain in full force and virtue.

AND the said surety for value received, hereby stipulates and agrees that no change, extension of time, alteration or addition to the terms of the contract or to the work performed here-under or the specifications accompanying the same shall in anyway affect its obligations on this bond and it does hereby waive notice of any such change, extension of time, alteration or addition to the terms of the contract or to the work or to the specifications.

This bond is made for the use and benefit of all persons, firms, and corporations who may furnish any material or perform any labor for or on account of said contract or rent or hire out any appliances and equipment used or employed in the execution of said contract, and they and each of them are hereby made obligees hereunder the same as if their own proper respective names were written herein as such, and they and/or each of them may proceed or sue hereon.

IN WITNESS WHEREOF, The principal has caused these presents to be signed in its name and behalf and its corporate seal to be here to affixed by ___________________________________

its __________________________________ , and ____________________________________

its __________________________________, thereto duly authorized, and the said surety has caused these presents to be signed in its name and behalf and its corporate seal to be hereto affixed by ...

____

its __________________________________ , and ____________________________________

its __________________________________ , thereto duly authorized at

____________________________________ , on this _______ day of ____________________

two thousand and _________________ .

PRINCIPAL	SURETY
___________________________________(Seal)	___________________________________(Seal)
___________________________________(Seal)	___________________________________(Seal)
_______________________________________	_______________________________________

Signed and sealed in the presence of

____

CERTIFICATE OF GOOD FAITH

The undersigned certifies under penalties of perjury that this bid is in all respects bona fide, fair and made without collusion or fraud with any other person. As used in this paragraph, the word "person" shall mean any natural person, joint venture, partnership, corporation or other business or legal entity.

Signature:____

Date:____

CERTIFICATE OF OSHA TRAINING OF PERSONNEL

The undersigned certifies that all persons they employ at the worksite will have successfully completed a course in construction safety and health approved by the United States Occupational Safety and Health Administration (OSHA) that is at least ten (10) hours in duration at the time the employee begins work and shall furnish documentation of successful completion of said course with the first certified payroll report for each employee.

Signature:____

Date:____

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SECTION 0800
SPECIAL PROVISIONS

DIVISION I
GENERAL REQUIREMENTS AND COVENANTS

SECTION 2.00
PROPOSAL REQUIREMENTS AND CONDITIONS

Delete all references to www.bidx.com and www.commbuys.com throughout this section.

SUBSECTION 2.02 INTERPRETATION OF BASIC ESTIMATE OF QUANTITIES

Add the following at the end of this subsection:

Certain items in the Bid cover classes of work of uncertain necessity or work for which it is impractical to estimate approximate quantities. Such items have been marked “indeterminate”.

SUBSECTION 2.03 EXAMINATION OF PLANS, SPECIFICATIONS, SPECIAL PROVISIONS AND SITE OF WORK

Add the following at the end of this subsection:

The plans for this contract, when applicable, have been prepared in part from field survey, utility company plans and other available sources. The accuracy and/or precision of this information are not guaranteed to be correct. Accordingly, it is the responsibility of the Contractor to verify all measurements and features of the project area by his own investigation and research.

SUBSECTION 2.04 PREPARATION OF BIDS

This section shall follow that provided in the 2020 Standard Specifications for Highways and Bridges and latest Supplemental.

SUBSECTION 2.05 DELIVERY OF BIDS

Replace this subsection with the following:

The Bidder shall submit to the location specified in the “Notice to Bidders” prior to the time set for opening of the bid his Bid properly sealed, delivered or mailed in accordance with the instructions printed thereon.

SUBSECTION 2.06 BID GUARANTY REQUIRED

Replace the last two paragraphs of this subsection with the following:

Each bid must be accompanied by a bid deposit in the form of cash, certified check, treasurer’s or cashier’s check, or a bid bond issued by a responsible bank or trust company and payable to the order of the Town of Lexington, MA. The check or Bid Bond shall be in the amount of five (5%) percent of the Bid and shall be enclosed in a sealed envelope separate from the envelope containing the Bid.

SUBSECTION 2.07 WITHDRAWAL OF BIDS

Replace this subsection with the following:

Except as hereinafter in this subsection otherwise provided, once a Bid is submitted and received by the Owner for consideration and comparison with other bids similarly submitted, the Bidder agrees that he may not and will not withdraw it within 30 consecutive calendar days after the actual date of the opening of bids.

Upon proper written request and identification, Bids may be withdrawn as follows:

1. At any time prior to the designated time for the opening of bids.
2. Death or serious injury of a principal.
3. With the approval of the Town.
4. At any time after the expiration of the period during which withdrawal is prohibited provided the bid has not been accepted by the Town.

Unless a Bid is withdrawn as provided above, the Bidder agrees that it shall be deemed open for acceptance until the Contract has been executed by both parties thereto or until the Owner notifies a Bidder in writing that his Bid is rejected or that the Owner does not intend to accept it, or returns his Bid deposit. Notice of acceptance of a Bid shall not constitute rejection of any other Bid.

SUBSECTION 2.08 PUBLIC OPENING OF PROPOSALS

This section shall follow that provided in the 2020 Standard Specifications for Highways and Bridges and latest Supplemental and COVID procedure.

SUBSECTION 2.09 REJECTION OF BIDS

Replace the first paragraph of this subsection with the following:

The Owner may reject Bids which fail to meet the requirements of Subsection 2.04, 2.05 and 2.06 or which are incomplete, conditional or obscure, or which contain additions not called for, erasures, alterations or irregularities of any kind, or in which errors occur, or which contain abnormally high or abnormally low prices for any class or item of work.

SECTION 3.00
AWARD AND EXECUTION OF THE CONTRACT

SUBSECTION 3.03 RETENTION OF PROPOSAL GUARANTY

Replace this subsection with the following:

Each bid check or bid bond amount may be retained by the Owner as security for the fulfillment of the Bidder’s agreements as specified in subsection 2.06 and as set forth in the Bid. Should the Bidder fail to fulfill such agreements, his bid check shall become the property of the Owner or if a bid bond was furnished, the bid bond shall become payable to the Owner as liquidated damages; otherwise, the bid check shall be returned to the bidder as hereinafter provided, or if the security is a bid bond, the bid bond shall be declared null and void.

Bid checks will be returned to all except the three lowest bidders within five days, Sundays and legal holidays excluded, after the opening of Bids and to the three lowest bidders within five days, Sundays and legal holidays excluded, after the owner and accepted Bidder have executed the Contract agreement. In the event that the Contract agreement has not been executed by both the Owner and the accepted Bidder within 30 consecutive days after the opening of Bids, the bid check will be returned promptly upon demand of any Bidder who has not been notified of the acceptance his Bid.

Bid checks accompanying Bids which are rejected will be returned within five days, Sundays and legal holidays excluded, after rejection.

None of the three lowest Bids shall be deemed rejected, notwithstanding acceptance of any Bid, until the Contract an agreement has been executed by both the Owner and the accepted Bidder.

SUBSECTION 3.05 EXECUTION OF CONTRACT

Replace the number 3 with the words "10 working".

SECTION 4.00
SCOPE OF WORK

SUBSECTION 4.01 INTENT OF THE CONTRACT

Add the following at the end of the first paragraph:

Additionally, the Contractor is responsible for satisfying all requirements set forth in the Order of Conditions (when applicable) as well as any additional documents that are located in the appendices.

SUBSECTION 4.02 ALTERATIONS

Add the following at the end of this subsection:

Except in an emergency endangering life or property, no change shall be made unless in pursuance of a written order from the Engineer authorizing the change and no claim for additional compensation shall be valid unless the change is so ordered.

SUBSECTION 4.10 FINAL CLEANING UP

Replace this entire subsection with the following:

4.10 CLEANING UP

The Contractor shall at all times and at his own expense keep the site of the work free from rubbish and debris caused by his operations under the Contract.

Upon completion of the work and before acceptance and final payment, the Contractor shall remove and dispose of in an approved manner, at his own expense, from the right-of-way, construction site and adjoining property, all temporary structures and all surplus materials and rubbish which the Contractor may have accumulated during the prosecution of the work, and shall leave the areas in a neat and orderly condition.

No equipment or material shall be left within any of the aforementioned areas after acceptance of the Contract without the written permission of the Engineer. The Contractor shall not abandon any material at or near the site regardless of whether or not it has any value.

All work areas shall be kept clean by the Contractor. The Contractor shall provide weekly sweeping of streets and gutters and daily sweeping of sidewalks within the Limits of Work, subject to approval of the Engineer. Additional sweeping may be necessary if determined by the engineer with no additional compensation.

The Contractor shall also be responsible for sweeping and cleaning of surfaces beyond the limits of the project to clean up material caused by spillage or vehicular tracking during the various phases of the work. Sweeping of sidewalks and streets shall be included in the various items and no additional compensation will be allowed therefore.

Add the following new subsection*:*

4.11 UTILITY MAINTENANCE

It shall be the Contractor's responsibility to maintain the drainage system in the areas under construction until such time the final system is put into use. Pipes and structures requiring cleaning as a result of sediment accumulation from construction operations shall be cleaned without additional compensation.

SECTION 5.00
CONTROL OF WORK

SUBSECTION 5.01 AUTHORITY OF THE ENGINEER

Add the following at the end of this subsection:

The Engineer shall be the owner's representative during the life of the Contract and he shall observe the Work in progress on behalf of the Owner.

The Contractor shall proceed without delay to perform the work as directed, instructed, determined or decided by the Engineer and shall comply promptly with such directions, instructions, determinations or decisions. If the Contractor has any objection thereto he may, within 10 days of having received any such direction, instruction, determination or decision, require that any such direction, instruction, determination or decision be put in writing and within 10 days after receipt of any such writing he may file a written protest with the Owner stating clearly and in detail his objections, the reasons therefor, and the nature and amount of additional compensation, if any, to which he claims he will be entitled thereby. A copy of such protest shall be filed with the Engineer at the same time it is filed with the owner. Unless the Contractor requires that any such direction, instruction, determination or decision be put in writing within 10 days of having received such direction, instruction, determination or decision and unless the Contractor files such written protest with the owner and Engineer within such 10 day period, he shall be deemed to have waived all grounds for protest of such direction, instruction, determination, or decision and all claims for additional compensation or damages occasioned thereby, and shall further be deemed to have accepted such direction, instruction, determination, or decision as being fair, reasonable, and finally determinative of his obligations and rights under the Contract.

SUBSECTION 5.05 COOPERATION BY CONTRACTOR

Add the following at the end of the second paragraph of this subsection:

He/She shall have full authority to execute the directions of the Engineer without delay and to supply promptly such labor, services, materials, equipment, plant, apparatus, appliances, tools, supplies and other items as may be required. Such superintendent shall not be removed from the work without the prior written consent of the Engineer.

If, in the opinion of the Engineer, the superintendent or any successor proves incompetent, the Contractor shall replace him with another person approved by the Engineer; such approval, however, shall in no way relieve or diminish the Contractor's responsibility for the work.

SUBSECTION 5.07 CONSTRUCTION (STAKES) STAKINGS

Replace this entire subsection with the following:

The Town will furnish general benchmark control for the project.

The Contractor, at his/her own expense, will furnish the following survey work:

A. Establishment of base lines or centerlines of construction for main roadways, service roads, side streets and other major dry land items. Reproduction of base lines and centerlines, or lines offset to them when roadway cuts and fills have been completed. Levels may be taken on the points marking these lines.

B. Original grade stakes at 50' intervals giving finished grades as per plan.

C. Preliminary and final surveys of pits (if borrow is paid by pit measure) and dredging areas, semifinal cross sections on ledge, peat, loam, etc.

D. Control for structures, which shall consist of range lines on centerline of bearings or centerline of piers, face of abutments and wingwalls, horizontal and vertical control for beam seats, along with benchmarks close to structures for vertical control. Structures shall include but shall not be limited to bridges, culverts, dams, buildings and walls.

E. Control for alignment of curbing or edging on ramps and at other complicated locations.

F. Bound points and sideline stakes.

G. All necessary stakes for pipes and head walls, and establish all catch basin and manhole locations as to line and grade.

The Contractor shall employ qualified engineering personnel to insure adequate control and shall furnish and set stakes of the quality used by the Department for control staking. Rough stakes may be used to denote top and bottom of slopes, edge of pavement, gutter lines, etc.

The Contractor shall furnish and set, at his/her own expense, all stakes (such as batter boards, slope stakes, pins, offset stakes, etc.) required for the construction operations and he shall be solely responsible for the accuracy of the line and grade of all features of his/her work.

The Contractor shall be held responsible for the preservation of all stakes and marks. If any of such stakes or marks are disturbed or destroyed the cost of replacing them shall be at the contractor's expense.

SUBSECTION 5.09 INSPECTION OF THE WORK

Add the following at the end of the first paragraph of this subsection:

The Contractor shall at all times provide safe and proper facilities therefor.

SECTION 6.00
CONTROL OF MATERIALS

SUBSECTION 6.03 DELIVERY AND STORAGE OF MATERIALS

Add the following at the end of this subsection:

THE DEPARTMENT WILL NOT ACCEPT ANY MATERIALS DELIVERED TO ANY PROJECT IN MOTOR VEHICLES OR SEMI-TRAILER UNITS THAT EXCEED THE LEGAL MAXIMUM GROSS WEIGHT ALLOWED FOR THE PARTICULAR CLASS, AS SPECIFIED IN SECTION 19A OF CHAPTER 90 OF THE GENERAL LAWS OF MASSACHUSETTS.

SECTION 7.00
LEGAL RELATIONS AND RESPONSIBILITY TO PUBLIC

SUBSECTION 7.01 LAWS TO BE OBSERVED, PART A. GENERAL

Add the following at the end of this subsection:

The Contractor shall protect, indemnify and save harmless the Owner, its officers, its Engineer, agents, servants and employees, from and against any and all claims, demands, suits, proceedings, liabilities, judgements, penalties, losses, damages, costs and expenses, including attorney’s fees, arising from or based upon any violation or claimed violation of any such law, ordinance, rule, regulation, order, decree or other requirement, whether committed by the Contractor or any of his agents, servants, employees or Subcontractors.

Each and every provision of law and clause required by law to be inserted in the Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though they were included herein. If through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the application of either party, the Contract shall be forthwith be physically amended to make such insertion.

SUBSECTION 7.05 INSURANCE REQUIREMENTS

Add the following at the end of this subsection:

The limits of the several kinds of liability insurance required for this Contract, in addition to insurance for Workmen's Compensation are as listed as follows:

The following types of insurance shall be provided by the Contractor:

a. Comprehensive General and Public Liability Insurance in an amount not less than $1,000,000 per occurrence and in an amount not less than $3,000,000 aggregate.

b. Bodily Injury Insurance covering the operation of all motor vehicles owned by the Contractor, in the amounts of $1,000,000 for any one person, $3,000,000 for any one accident.

c. Property Damage Insurance covering the operation of all motor vehicles owned by the Contractor, in the amounts of $1,000,000 for any one accident, $3,000,000 aggregate.

d. Insurance to cover bodily injury and property damage resulting from the use of motor vehicles not owned by the Contractor, while such vehicles are being operated in conjunction with the prosecution of the Work under this contract, in the amount required under b) and c) above.

e. Worker's Compensation and Employer's Liability as required by the General Laws of the Commonwealth of Massachusetts.

All policies shall be so written that the certificate holder, namely the Town of Lexington, 1625 Massachusetts Avenue, Lexington, MA 02420 is insured at no cost to the Town for the full amounts stated above.

The Contractor shall name the Town of Lexington as an additional insured.

SUBSECTION 7.09 PUBLIC SAFETY AND CONVENIENCE

Add the following at the end of this subsection:

During construction, the Contractor shall maintain at least two 12-foot travel lane during the day and shall open the road up to two-way traffic at night. It is the Contractor’s responsibility to obtain approval for any lane closings, delays or detours at least 24 hours in advance by the Town of Lexington Engineering Division. Additionally sidewalks must be left open at all times or proper accessible pedestrian detour put in place prior to closure.

The Contractor shall remove at their own expense any and all equipment from roadways as directed by the Engineer and/or the Safety Officer at the conclusion of the working day.

At the end of each working day where trenches in areas of public travel are covered with steel plates, (Ref. subsection 7.09), each edge of such plates shall either be beveled or protected by a slope of 2 feet horizontally to 1 inch vertically. Any temporary patching material may be used to construct the ramps. The cost of necessary patching materials, and their maintenance and removal, will be considered incidental to the item involved with no separate payment.

The Contractor shall maintain access to all drives at all times. If access to any drives cannot be maintained, the Contractor shall notify the Engineer and persons affected, in writing, at least one week in advance of the planned discontinuance. In any case, the access shall not be discontinued for more than two consecutive days without obtaining the written authorization of the Engineer.

The Contractor shall erect temporary fencing as required to secure the work site for the purpose of public safety. The work shall include furnishing, installing, maintaining, removing, resetting, and final removal of fencing. The fence shall be used to close off the construction area from adjacent sidewalks and public ways, whose use conflicts with the construction activities. All work to furnish, install, relocate and remove temporary fencing shall be considered incidental to and no separate payment will be made.

All construction shall be completed to Intermediate (binder) course in all phase prior to applying any surface course. Surface course shall be applied continuously in an effort to minimize jointing. Where joints are required, the relevant provisions of Section 460 shall be employed.

SUBSECTION 7.11 TRAFFIC OFFICERS AND RAILROAD FLAGGING SERVICE

Replace the first three paragraphs of this subsection with the following:

Traffic Police Details and Fire Details shall be provided for as stipulated in Section 850 of the Special Provisions for the Contract.

SUBSECTION 7.13 PROTECTION AND RESTORATION OF PROPERTY

Add the following at the end of this subsection:

A. Protection of Utilities and Property

The Contractor shall be responsible for locating, maintaining and protecting all existing utilities. Pipes or other structures damaged by the Contractor may be repaired by the Town, Department, or utility company that suffers the loss. The cost of such repairs shall be at the expense of the Contractor. Should any damage to a utility caused by the Contractor result in an emergency, the Contractor shall promptly warn the Owner and, if requested, furnish laborers to work temporarily under the Owner's direction in gaining access to the utility.

If live service connections are to be interrupted by excavation of any kind, the Contractor shall not break the service until new or temporary services are provided. Abandoned services shall be plugged off or otherwise made secure.

The Contract Plans indicate the location of existing known utilities in the vicinity of the work. Bidders are cautioned to verify this information, as its accuracy and completeness are not guaranteed in any manner.

B. Notice to Owners of Utilities

Written notice shall be given by the Contractor to all public service corporations or officials owning or having charge of publicly or privately owned utilities of his/her intention to commence operations affecting such utilities at least one week in advance of the commencement of such operations, and the Contractor shall at that time file a copy of such notice with the Engineer.

Before the Contractor begins any work or operations that might damage any subsurface structures, he shall carefully locate all such structures and conduct his/her operations so as to avoid any damage to them.

The Contractor shall hand deliver notices to abutting properties at least 24 hours before the start of construction. The notice will indicate the timing of the construction and any access restrictions or other inconveniences that may result.

The Contractor shall notify and coordinate with Waste Management, the Town's waste disposal contractor when construction activities will correspond with waste pickup. A pickup schedule will be provided upon the request by the Contractor.

The Contractor shall notify and coordinate with school bus and transit companies when construction operations will affect routes.

Function	Company	Contact	Number
Waste Disposal	JRM		800-323 4285
School Bus	C&W Transportation		781-862-4747
LEXPRESS	Town of Lexington	Susan Barrett	781-861-1210
Liberty Ride		Casey Hagerty	781-698-4568

COORDINATION OF UTILITIES

The following is contact information of the principal utilities affected, but completeness of this list is not guaranteed. It will be the contractor responsibility to verify this contact information and to notify the Town of changes to this list.

Telecommunications:

RCN Cable
Kenneth Bates, Engineer 4
Margot Jones, Engineering Manager
Alex Ortiz, Construction Manager
RCN Corporation
956 Mass. Ave.
Arlington, MA 02476
O: 781-316-8885
C: 617-293-0201
F: 781-316-8887
margot.jones@rcn.net
alex.ortiz@rcn.net
Ken.bates@rcn.net

Comcast Cable
Wendy Brown, Cost Recovery Analyst
Comcast Cable Corporation
676 Island Pond Road
Manchester, NH. 03109
603-541-1082
Wendy_Brown@comcast.com

Verizon
Verizon Engineering Center
Mike Barros
385 Myles Standish Blvd
Taunton, MA 02780
866-686-1195
ma-ri.osp.center@verizon.com

Level 3 Communications
Pat Provost, Business Analyst, OSP Relocations
Level 3 Communications
1025 El Dorado Blvd
Broomfield, CO 80021
720-888-0916
relo@centurylink.com

186 Comm c/o Waveguide Inc.
Jeff Harrington ,OSP Construction
359 Corporate Dr.
Portsmouth, NH 03801
C: 617-999-5371 |
jharrington@firstlight.net | www.firstlight.net

AT&T
Hayleigh Walker-Kurland, Project Coordinator
Siena Engineering Group, Inc
50 Mall Road, Suite 203
Burlington, MA 01803
781- 221-8400 x7023
Hayleigh.Walker@sienaengineeringgroup.com

Gas:

NationalGrid
Gene Au, Project Engineer
40 Sylvan Rd
Waltham MA 02451
781-907-3813
gene.au@nationalgrid.com

Tennessee Gas Pipeline
David Wood
8 Anngina Drive
Enfield, CT 06082
O: 860-763-6005
C: 413-530-7117
David_wood@kindermorgan.com

Electricity:

Eversource
Kim Khounesombat, Account Executive and
247 Station Drive
Westwood, MA 02090
O: 781-441-8922
C: 774-826-5562
kim.khounesombat@eversource.com

Water and Sewer:

Town of Lexington Water/Sewer Department
Dave Pavlik, W/S Superintendent
201 Bedford Street
Lexington, MA 02421
781-274-8300
dpavlik@lexingtonma.gov

Kevin McKenna	Ralph Francesconi
MWRA-Wastewater	MWRA-Water
2 Griffin Way	2 Griffin Way
Chelsea, Ma. 02150	Chelsea, Ma. 02150
617-305-5956	617-305-5827
kevin.mckenna@mwra.com	Ralph.Francesconi@mwra.com

C. Protection of Underground Facilities

The Contractor's attention is directed to the necessity of making his/her own investigation in order to assure that no damage to existing structures, drainage lines, etc., will occur.

The Contractor shall notify 'Mass DIG SAFE' and procure a DIG SAFE number for each location prior to disturbing existing ground in any way. The contractor shall notify **Lexington DPW** in addition to **DigSAFE** as Lexington is currently not a member.

DIG SAFE Call Center	(888) 344-7233

The Contractor shall be responsible for informing utility owners in the event of any disruption of service or damage of any utility, marked or not. THE CONTRACTOR SHALL HAVE A MEANS OF TELEPHONE COMMUNICATION AND CONTACT NUMBERS ON SITE AT ALL TIMES.

D. Property Bounds

Should any damage to a bound result from the actions of the Contractor, the bound shall be replaced and/or realigned for the Contractor by a professional surveyor register in the commonwealth of Mass retained by the Contractor. Stamped Documentation shall be provided. No further compensation will be due the Contractor for the materials and labor required to re-establish the bound in its proper position as shown on the plans.

SUBSECTION 7.18 CONTRACTOR’S RESPONSIBILTY FOR THE WORK

Replace the second paragraph of this subsection with the following:

The Contractor shall take all precautions necessary to prevent damage to the work by storms or by water entering the site of the work directly or through the ground. In case of damage by storm or water, the Contractor shall at his own cost and expense make such repairs or replacements or rebuild such parts of the work as the Engineer may require in order that the finished work may be completed as required by the Contract.

The Contractor shall bear all losses resulting to him on account of the amount or the character of the work or because the nature of the land in or on which the work is done is different from what was estimated or expected, or other causes (except as stated in Subsection 4.04, Changed Conditions).

Concurrent work may be in progress in the project area by others, including but not limited to, the Town and various utility companies. The Contractor is required to coordinate his activities with all work by others within and adjacent to the project limits.

The Contractor’s attention is brought to the fact that Eversource/NGRID will be performing some concurrent gas relocation work to remove conflicts with drainage structures. The Contractor shall coordinate with Eversource/NGRID on the scheduling of this work.

SUBSECTION 7.19 PERSONAL LIABILITY OF PUBLIC OFFICIALS

Replace all references to "the Commonwealth" with "the Town".

SECTION 8.00
PROSECUTION AND PROGRESS

SUBSECTION 8.03 PROSECUTION OF WORK

Add the following at the end of the first paragraph of this subsection:

The Engineer will schedule and administer progress meetings and specially called meetings throughout the duration of the Work at minimum weekly intervals. The time and location of such meetings shall be designated by the Engineer and shall be convenient for all parties involved. The Engineer will prepare agenda with copies for participants, preside at meetings, record minutes, and distribute copies to participants, and those affected by decisions made. The Contractor shall provide precision looking schedule 10 days ahead to ensure proper notification of businesses.

Additionally, the work under this contract shall progress by area, whereas, the contractor may not progress to work on the next area until substantial work on the previous area has been completed. 'Substantial Completion' as stated here shall be defined as the sidewalk work complete, curb installed, driveway aprons complete, loam and seed in place, and excess material and material storage piles removed. Once completed the contractor shall submit and updated schedule and receive approval from the engineer before progressing to the next area. The Engineer will consider requests for work in more than one area at a time under special circumstances, however, it shall be the sole discretion of the engineer in the allowance of this activity. For the purposes of this contract the areas are labeled on the construction phasing plans. There is not a requirement that they be performed in the order labeled.

A traffic control must be submitted a minimum of 10 days in advance of work in any given area.

The Contractor shall follow the requirements for Traffic Management unless otherwise directed by the Town. Traffic Management Typical Details are included as part of the contract documents.

The Contractor shall prepare and submit to the Town a proposed work schedule which complies with the plans and specifications. No work shall begin until the Town's approval of the schedule. A traffic control plan must be submitted a minimum of 10 days before construction starts in any given area.

SUBSECTION 8.05 CLAIM FOR DELAY OR SUSPENSION OF THE WORK

Replace all references to "the Commission" with "the Town".

Add the following at the end of this subsection:

If in the event the Contractor shall make a claim for delay or suspension of the work, the Contractor shall continue prosecution of the work during the period pending resolution of the claim or delay.

SUBSECTION 8.09 DELAY AND SUSPENSION OF THE WORK

Replace all references to "the Commonwealth" with "the Town".

SUBSECTION 8.10 DETERMINATION & EXTENSION OF CONTRACT TIME FOR COMPLETION

Add the following at the end of this subsection:

The Contractor shall suspend all work in streets between November 15 and Partiots Day, unless otherwise permitted by the Engineer. The time for completion established for the contract has already taken into account the shutting down operations for the winter.

Add the following new subsection:

SUBSECTION 8.14 NIGHT, SATURDAY, SUNDAY AND HOLIDAY WORK

Work on this project is restricted to a normal eight hour day (7:00 AM to 4:00 PM), five-day week, with the Prime Contractor and all Subcontractors working on the same shift. No work, including the setting up and taking down of work area traffic control devices shall be done within existing roadways between the hours of 7:00-7:30 AM and after 3:30 PM, unless otherwise approved by the Town. No work shall be done at night, on Saturdays, Sundays or Town observed Holidays except (1) usual protective work, such as pumping and the tending of fires, (2) work done in case of emergency threatening injury to persons or property, or (3) if all of the conditions set forth in the following paragraph below are met:

No work other than that included in (1) and (2) above shall be done at night except when (a) in the sole judgement of the Town, the work will be of advantage to the Owner and can be performed satisfactorily at night, (b) the work will be done by a crew organized for regular and continuous night work, and (c) the Engineer has given written permission for such night work.

SECTION 9.00
MEASUREMENT AND PAYMENT

SUBSECTION 9.04 PARTIAL PAYMENTS

Replace all references to "biweekly" with "monthly".

Replace the second paragraph of this subsection with the following:

There will be a retainage of ten (10%) percent for all planting items. For all other items of work there will be a retainage of five (5%) percent of the value of said items.

SUBSECTION 9.05 FINAL ACCEPTANCE AND FINAL PAYMENT

Replace this entire subsection with the following:

Fixing of the date of completion and acceptance of the work or a specified part thereof shall only be effective when accomplished by a writing specifically so stating and signed by the Owner.

A. Partial Acceptance and Payment

At any time, the Owner may issue a written order to the Contractor declaring that he intends to utilize a specified portion of the work which in his opinion has been sufficiently completed in accordance with the Contract. A tentative list of items remaining to be completed or corrected shall be included with this order.

Within 45 days after acceptance under this subsection, the Engineer shall make an estimate in writing of the amount and value of the part of the work so accepted. The Owner shall pay said amount to the Contractor after deducting therefrom all previous payments, all charges against the Contractor as provided for hereunder, and all amounts to be retained under the provisions of the Contract, said payment to be made at the time of the next monthly progress estimate.

Acceptance by the Owner under this subsection shall not relieve the Contractor of any obligations under the Contract except to the extent agreed upon in writing between the Owner and the Contractor. The Owner shall have the right to exclude the Contractor from any part of the work which has been accepted, but the Owner shall allow the Contractor reasonable access thereto to complete or correct items on the tentative list.

B. Final Acceptance and Payment

The Owner shall pay to the Contractor the entire amount found by the Engineer to be earned and due hereunder after deducting there from all previous payments and all amounts to be kept and all amounts to be retained under the provisions of the Contract. All prior partial estimates and payments shall be subject to correction in the final estimate and payment. Except as in this subsection otherwise provided, such payment shall be made no later than 15 days after but in no event before the expiration of the time within which claims for labor performed or materials or equipment furnished must be filed under the applicable lien law, or, if such time is not specified by law, the expiration of 30 days after the completion of the Engineer's final estimate.

If within six months from the date the final estimate is forwarded to the Contractor, the Contractor has not filed a valid (as by the Engineer) written reasons(s) for not accepting the final estimate, the final estimate will be considered acceptable to the Contractor and payment of the final estimate made. The acceptance by the Contractor of the final payment shall operate as and shall be a release to the Party of the First Part and every member, agent and employee thereof, from all claims by the Contractor for anything done or furnished for, or relating to the work or for any act or neglect of the Party of the First Part or of any person relating to or affecting the work, except the claim against the Party of the First Part for the remainder if any there be, of the amounts kept or retained as provided in Subsection 7.15.

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SECTION 0900
DIVISION II
SUPPLEMENTAL PROVISIONS

SECTION 120
EXCAVATION

DESCRIPTION

SUBSECTION 120.20 GENERAL

Add the words "Removal and Disposal of surplus road base" after the words "Unclassified Excavation" in the last sentence of the first paragraph.

Add the following at the end of this subsection:

All locations to be excavated shall be stripped of topsoil prior to excavation. This work shall be paid at the unit price for topsoil excavated and stacked.

The contractor will be responsible for obtaining all the necessary permits and for finding a proper area to dispose of surplus material.

Any Petramat or other fabric material that is encountered during cold planer operations and not thoroughly bonded to the existing asphalt shall be removed by the contractor prior to proceeding with resurfacing.

Add the following new subsection:

SUBSECTION 120.27 REMOVAL AND DISPOSAL OF SURPLUS ROAD BASE

This work shall include the excavation of excess reclaimed road base as directed by the engineer. All surplus material resulting from reclamation and not needed for use on the project, as determined by the Engineer, shall be disposed of by the contractor outside and away from the limits of the project, with no additional measurement or payment.

Add the following new subsection:

SUBSECTION 120.28 EXCAVATION FOR PATCHING

This work shall include the excavation of existing pavement and /or sub-base as well as any boulders or rock below the sub-base as necessary. The work shall also include the grading and compaction of sub-base to the required cross section as shown on the plans or as directed by the Engineer. All surplus material resulting from excavation and not needed for use on the project, as determined by the Engineer, shall be disposed of by the contractor outside and away from the limits of the project, with no additional measurement or payment.

Add the following new subsection:

SUBSECTION 120.29 EXCAVATION FOR ROAD WIDENING AND RELOCATION

This work shall include all excavation along the edge of the existing roadway for the purpose of road widening and/or relocation. Said work shall be preformed in a manner as to protect any and all existing utilities and landscape material from damage.

Add the following new subsection:
SUBSECTION 120.30 SAWCUTTING

This work shall include the full depth cutting of the existing pavement, which may include sawcutting for granite curb, driveways, reclaim end treatment, drainage and roadway patching unless otherwise noted in such items as inclusive. Sawcutting shall be complete to the existing sub-base by a motorized saw along lines as shown on the plans or as directed by the Engineer.

No separate payment will be made for sawcutting required for installation of drainage, and water pipe trenches, structures, conduit trench, and permanent utility trenches, but all costs in connection therewith shall be included in the unit price bid for applicable items.

CONSTRUCTION METHODS

SUBSECTION 120.60 GENERAL

Add the following at the end of this subsection:

D. Care when excavating for sidewalks

The Contractor shall take all necessary precautions to prevent damage to walls, building foundations, and fences abutting sidewalks and driveways designated for replacement. Where required, new sidewalks shall meet said walls and fences. Prior to sidewalk removal, a sawcut shall be provided in all sidewalks to be removed a distance, to be determined by the Town of Lexington Department of Public Works (6 inches minimum) from the face of adjacent buildings, retaining walls, and fences. The final 6 inches (minimum) of sidewalk will be removed with caution under the resident Town of Lexington Department of Public Works' supervision. There will be no additional payment for labor or equipment necessary to meet this "remove with caution" requirement. The Contractor is responsible for damage to walls, foundations and fences due to his construction activities and shall be repaired at the Contractor's own cost. Any brick, paver, or stamped concrete/asphalt sidewalk, crosswalk, or roadway disturbed by construction activity shall be repaired by the Contractor at no additional cost. Any brick, paver, or stamped concrete/ asphalt sidewalk, crosswalk, or roadway damaged or to be restored shall match the same materials that exist, including concrete base if appropriate, unless otherwise indicated on the plans, or directed by the Engineer.

When practical sawcuts shall be made at existing control joints.

SUBSECTION 120.65 TOPSOIL EXCAVATED AND STACKED

Add the following at the end of this subsection:

The Contractor will restore any areas used or damaged in the stockpiling operation at his own expense.

SUBSECTION 120.66 BITUMINOUS CONCRETE EXCAVATION BY COLD PLANER

In the third paragraph change the word 'three' to 'four':

Add the following at the end of this subsection:

Any Petramat or other fabric material that is encountered during cold planer operations and not thoroughly bonded to the existing asphalt shall be removed and properly disposed of by the contractor prior to proceeding with resurfacing as directed by the engineer. Removal shall be performed with the use of a utility knife or other method approved in advance by the engineer.

Add the following new subsection:
SUBSECTION 120.68 REMOVAL AND DISPOSAL OF SURPLUS ROAD BASE

This work shall include the excavation, removal and satisfactory disposal, in accordance with relevant provisions of Section 120.60 of all materials listed under Section 120.27 as directed by the engineer.

COMPENSATION

SUBSECTION 120.80 METHOD OF MEASUREMENT
Add the following at the end of this subsection:

Any rock or boulders that must be excavated and measure less than one cubic yard in volume shall be considered incidental to the excavation work with no additional measurement of payment to be made. Any rock or boulders that must be excavated and measure one cubic yard or greater in volume shall be considered Class A Rock and shall be measured in accordance with the pay limits as described above.

SUBSECTION 120.81 BASIS OF PAYMENT
Add the following at the end of this subsection:

Sawcutting will be consider incidental to the Uclassified Excavation, no separate paymenent to be made.

Any Petramat or other fabric material removed and disposed of as part of cold planer operations shall be consider incidental to the Uclassified Excavation, no separate paymenent to be made.

SECTION 130
STREET SWEEPING

DESCRIPTION

SUBSECTION 130.20 GENERAL

Street sweeping shall be by mechanical street sweeper vehicle to clear the paved surface of all debris, to the extent as determined by the Engineer.

CONSTRUCTION METHODS

SUBSECTION 130.60 GENERAL

The timing of the street sweeping operation should be such that the road remains sufficiently clean between the completion of the sweeping and the start of any reclamation and/or repaving. Should the Engineer decide that the road surface requires additional sweeping, no additional compensation shall be offered the Contractor to complete this process.

No additional compensation will be allowed when street sweeping operations are used as a means of clearing off and/or exposing areas of pavement covered with vegetation or debris.

COMPENSATION

SUBSECTION 130.81 BASIS OF PAYMENT

When sweeping is performed in preparation for paving operations then it shall be inclusive to the paving items.

SECTION 150
EMBANKMENT

CONSTRUCTION METHODS

SUBSECTION 150.64 BACKFILLING FOR STRUCTURES AND PIPES

Revise the 2nd sentence of this subsection to read as follows:

When suitable backfill material cannot be obtained from excavation, gravel borrow shall be used.

COMPENSATION

SUBSECTION 150.80 METHOD OF MEASUREMENT

Add the following after the 9th paragraph of this section:

Crushed Stone (¾”) when used for pipe bedding shall be included in the item price for the associated pipe, with no separate measurement or payment.

Insert the following new section in numerical order:

SECTION 153
CONTROLLED DENSITY FILL

DESCRIPTION

SUBSECTION 150.20 GENERAL

Excavatable Controlled Density Fill (CDF) shall be used as backfill material in utility trenches, abandoned structures and other locations as determined by the Engineer.

MATERIALS

SUBSECTION 150.40 GENERAL

Materials shall meet the requirements specified in the following subsection of Division III, Materials:

Controlled Density Fill, Type 2E	M4.08.0

CONSTRUCTION METHODS

SUBSECTION 150.60 GENERAL

Controlled Density Fill shall be placed in a manner such that no damage will occur to utility lines, pipes or structures. The material shall be placed so that no voids are left upon completion of the backfilling process.

Steel road plates shall protect the CDF until the fill reaches a point that it will not be deformed by traffic passing over it. Per direction of the Engineer, CDF may be left one foot below bottom of asphalt with remaining backfill material placed after appropriate curing time as directed by the Engineer. Additional backfill will be paid at contract unit price for the material used as directed.

COMPENSATION

SUBSECTION 150.80 METHOD OF MEASUREMENT

Controlled Density Fill shall be measured in place by the cubic yard.

SUBSECTION 150.81 BASIS OF PAYMENT

Payment for Controlled Density Fill will be paid for at the contract unit price per cubic yard. No additional compensation shall be offered for material placed beyond the limits of excavation as shown in the plans or as determined by the Engineer.

Additional backfill will be paid at contract unit price for the material used as directed.

SUBSECTION 150.82 PAYMENT ITEMS

ITEM 153.	Controlled Density Fill - Excavatable	Cubic Yard

SECTION 201
BASINS, MANHOLES AND INLETS

MATERIALS

SUBSECTION 201.40 GENERAL

Add the following at the end of this subsection:

Clay brick conforming to Section M4.05.2 of the Standard Specifications shall be used to adjust all manholes and catch basin frames and grates or covers to grade. For sewer manholes, Grade SS bricks shall be used for sewer inverts and shelves. Grade MS bricks shall be used for other locations.

Castings shall be as follows, or as directed by the Engineer:

- All Manhole Cover Frames shall be as manufactured by EJ a.k.a. East Jordon Iron Works meeting the following: EJIW product #00211111 (0MA211000038, 8 inch depth) Upon approval of the engineer 6-inch frames may be utilized in defined locations and shall meet the following EJIW product #00226611 (0MA226000002, 6 inch depth)

- Drain Manhole Covers shall be EJIW 0MA211000041 or approved equal (The word DRAIN in 2-inch, flat face, gothic letters shall be cast into the cover)

- Sewer Manhole Covers shall be EJIW 0MA211000040 or approved equal (The word SEWER in 2-inch, flat face, gothic letters shall be cast into the cover)

- Catch Basin Frames with 3 flanged sides shall be EJIW product #00554813 (0MA554000005, 8-inch deep) or approved equal. Upon approval of the engineer 6-inch frames may be utilized in defined locations and shall meet the following 0MA554000003, 6 inch depth.

- Catch Basin Frames with 4 flanged sides shall be EJIW product #00554811 (0MA554000006, 8-inch deep) or approved equal. Upon approval of the engineer 6-inch frames may be utilized in defined locations and shall meet the following 0MA554000004, 4 inch depth.

- Double Catch Basin Frames with 3 flanged sides shall be EJIW product #00554814 (0MA544000001, 8-inch deep) or approved equal. Upon approval of the engineer 4-inch frames may be utilized in defined locations and shall meet the following 0MA544400106, 4 inch depth.

- Double Catch Basin Frames with 4 flanged sides shall be EJIW product #00554812(0MA544000002, 8-inch deep) or approved equal. Upon approval of the engineer 4-inch frames may be utilized in defined locations and shall meet the following 0MA544400012, 4 inch depth.

- Catch Basin Grates shall be EJIW product #0055284 (0MA552000076) or approved equal for Cascade Left or product #0055285 (0MA552000077) or approved equal for Cascade Right (The words DUMP NO WASTE in 1/2-inch, letters shall be engraved into the edge of grate along one side)

All exterior surfaces of manhole brickwork shall be plastered with cement mortar.

Leaching basins shall be precast concrete structures as approved by the Engineer.

CONSTRUCTION METHODS

SUBSECTION 201.60 GENERAL

Add the following at the end of this subsection:

Catch basins may be required to be built on (connected to) existing lines. Work may include, but is not limited to, excavation around existing pipe, removal/trimming existing pipe to inside face of catch basin, building new catch basin around existing pipes (including base and 4' sump), and backfilling/compacting around catch basin.

It shall be the Contractor's responsibility to maintain a proper drainage system at all times in the areas under construction. Existing drainage shall not be taken out of service without prior written notice to the Town. All pipes and structures installed as part of this Contract shall be left in a clean and operable condition at the completion of the work. Drainage pipes and structures requiring cleaning as a result of accumulations from construction operations shall be cleaned of debris within one (1) week after surface course pavement has been completed.

Drainage castings in new pavement areas shall be installed at base or binder course grade, as directed by the Engineer, and reset to proposed finish surface grade prior to placement of the pavement surface course. All existing pipes to be abandoned shall be plugged with brick masonry not less than 8" in thickness in conformance with the MassDOT Standard Specifications, Section 201.62.

No separate payment will be made for sawcutting required for installation of drainage pipe trenches and structures. All such costs shall be taken as included in the unit prices bid for the various pipe items.

No separate payment will be made for the maintenance of the existing drainage system, for plugging of pipes, or for cleaning and disposal of material from impacted drainage structures and pipes (unless otherwise provided for under this contract), but all costs in connection therewith shall be included in the unit prices bid for the various Contract items.

The limits of the excavation shall be sawcut or milled full depth through all existing pavement prior to any excavation for structure placement.

SUBSECTION 201.63 PLACING CASTINGS

Delete the following sentence

‘Cement Concrete collars shall be placed around the castings after the final setting as shown on the plans and as directed’

Replace with the following sentence

‘Asphalt Concrete collars shall be placed around the castings after the final setting as shown on the plans and as directed’

Add the following at the end of this subsection:

All three-flanged rectangular frames shall be placed as described above. The side of the casting without a flange shall be filled in with bricks and mortar or steel plates sufficient to cover any opening in the structure or as directed by the Engineer. Said work shall be considered incidental to Item 220, Drainage Structure Adjusted with no additional measurement or payment to be made.

SUBSECTION 201.65 LAYING BRICKS AND BLOCKS

Add the following at the end of this subsection:

> A minimum of 2 courses of brick shall be used to set frames on all manholes, catch basin and leaching basins.

Add the following new subsection:

SUBSECTION 201.66 LEACHING BASINS

Leaching basins shall be constructed with 4-foot sumps and shall be surrounded by 2 feet of crushed stone. Filter fabric shall line the entire excavation for the leaching basin up to the existing surface.

COMPENSATION

SUBSECTION 201.80 METHOD OF MEASUREMENT

Replace the first two paragraphs of this section with the following:

Measurement for catch basins, leaching basins, manholes and drop inlets shall be measured as complete units regardless of depth.

All cement blocks, filter fabric and stone associated with the construction of leaching basins shall be considered incidental to the cost of the leaching basin with no additional measurement or payment.

Sawcutting or milling of existing pavement to the excavation limits for structure placement shall be considered incidental to the cost of associated items, with no additional measurement or payment.

SUBSECTION 201.81 BASIS OF PAYMENT
Delete the following sentence
'Payment for the concrete collars shall be included in the contract unit price of the structure involved'

Replace with the following sentence
'Payment for the asphalt collars shall be included in the contract unit price of the structure involved'

Add the following at the end of this subsection:

All costs associated with construction of catch basins saddling existing drainage lines shall be included in the unit price per catch basin.

Crushed Stone (M2.01.1) when used for structures bedding shall be included in the item price for the associated strucutres, with no separate measurement or payment.

SECTION 230
CULVERTS, STORM DRAINS AND SEWER PIPES

CONSTRUCTION METHODS

SUBSECTION 230.60 GENERAL

Add the following at the end of this subsection:

For all pipes, including services, the limits of the trench shall be sawcut or milled full depth through all existing pavements prior to any excavation for pipe placement.

Add the following new subsection:

SUBSECTION 230.66 UTILITY WARNING AND IDENTIFICATION TAPE

Buried Utility Warning and Identification Tape shall be placed at locations as directed by the Engineer. Said warning tape shall be made of plastic backed aluminum foil tape or detectable magnetic plastic tape with a minimum width of 3 inches. It shall be color coded and labeled continually along entire length of the tape in bold black letters for the appropriate utility, and detectable by an electronic detection instrument. The markings on the tape should be permanent and unaffected by moisture or light.

Buried Utility Warning and Identification Tape shall be considered incidental to the work being done and no additional compensation will be offered for this item.

COMPENSATION

SUBSECTION 230.80 METHOD OF MEASUREMENT

Revise the 5th sentence of this subsection to read:

The placement of pipe bedding shall be considered incidental to the placement of associated pipe, with no separate measurement or payment.

Sawcutting or milling of existing pavement to the excavation limits for pipe placement shall be considered incidental to the cost of associated items, with no additional measurement or payment.

SECTION 270
PIPES REMOVED AND RELAID OR STACKED

Change the title of this Section to read:

SECTION 270
PIPES REMOVED AND RELAID, STACKED OR DISPOSED

DESCRIPTION

SUBSECTION 270.20 GENERAL

Replace this subsection with the following:

This work shall consist of removing present pipes and relaying, stacking or disposing them in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

CONSTRUCTION METHODS

Add the following new Subsection:

SUBSECTION 270.64 DISPOSING

All pipe removed and scheduled to be disposed, shall be disposed of by the Contractor outside and away from the limits of the project, with no additional measurement or payment, and in accordance with any state, local and federal laws.

COMPENSATION

SUBSECTION 270.80 METHOD OF MEASUREMENT

Add the following at the end of this subsection:

Pipes removed and disposed, as directed, will be measured as the actual length of pipe removed.

SUBSECTION 270.81 BASIS OF PAYMENT

Add the following at the end of this subsection:

Pipes removed and disposed will be paid for at the contract unit price per linear foot of pipe required to be removed and disposed.

SUBSECTION 270.82 PAYMENT ITEMS

Add the following payment items in numerical order:

ITEM 272.	Pipe Removed and Disposed	Linear Foot

SECTION 301
WATER SYSTEMS

DESCRIPTION

SUBSECTION 301.20 GENERAL

Replace the entire subsection with the following:

Work under this section shall consist of making alterations, replacements, and/or new construction of existing municipal water distribution systems. The work includes furnishing and installing new water pipe and appurtenances, and removing, resetting, and/or properly disposing of existing materials in the same or new locations in accordance with these specifications and in close conformity with the lines and grades shown on the plans or established by the Engineer.

Water pipe shall be of the type, kind, size and class as shown on the plans and as directed. The pipe shall be laid on a firm foundation with tight joints and properly protected in a trench excavated and backfilled in accordance with these specifications and accompanying plans and as directed by the engineer.

When requested by the Engineer, submit shop drawings for approval for materials specified in this section.

SUBSECTION 301.22 PROTECTION OF UNDERGROUND STRUCTURES

Replace this entire subsection with the following:

The Contractor shall take every precaution to protect all conduits, pipe or structures uncovered during excavation. In the event that a pipe or structure that has been unmarked or is mistakenly marked in the field or on the plans is damaged by the Contractor, an allowance shall be made by the Town for compensation to the Contractor for the cost to repair the damage. No compensation shall be made for pipes or structures that are damaged that have been correctly marked out in the field or on the plans.

MATERIALS

SUBSECTION 301.40 GENERAL

Replace or add the Division III material references in this section with the following:

DUCTILE IRON PIPE AND FITTINGS

Shall meet the requirements of AWWA/ANSI C151/A21.51-17, AWWA/ANSI C111/A21.11-17 and AWWA/ANSI C104/A21.4. Ductile Iron Pipe and Fittings shall be Tyton Joint or approved equal. Ductile iron pipe shall have a minimum thickness class of class 52 unless specified otherwise on the plans.

The exterior of ductile iron pipe and fittings shall be coated with a layer of arc-sprayed zinc per ISO 8179. The mass of the zinc applied shall be 200 g/m2 of pipe surface area. A finishing layer topcoat shall be applied to the zinc. The coating system shall conform in every respect to ISO 8179-1 "Ductile iron pipes - External zinc-based coating - Part 1: Metallic zinc with finishing layer. Second edition 2004-06-01."

Mechanical joint ductile iron fittings shall be Class 350. Fittings shall conform to ANSI/AWWA C153/A21.53 and AWWA/ANSI C111/A21.11-17. Mechanical joint nuts and bolts shall be high strength, low alloy steel in conformance with AWWA/ANSI C111/A21.11.

Joints for pipe and fittings shall be push-on, restrained push-on, or restrained mechanical joint conforming to ANSI/AWWA C111/A21.11.

Joint restraint for mechanical joint pipe shall be Megalug as shown in the Plans or in the Town Standard Drawings, MJ Field Lok gasket or approved equal. The restraining system shall be pressure rated to 350 psi in sizes up to 16-inch and shall be rated at 250 psi for sizes 18-inch to 24-inch. The pressure rating for DI restraints shall be based on a 2:1 safety factor or up to 350 psi depending on the class of pipe used.

Tapping sleeves shall be ductile iron construction meeting ASTM A536 Grade 65-45-12. Side flange seals shall be of O-ring type. Sleeve shall be coated with asphaltic varnish in compliance with NSF-61.

All couplings will be solid-sleeve type.

Boltless restrained joint pipe for construction in poor soil conditions when required will be installed with US Pipe Field Lok 350 gaskets or equivalent. The restraint provided shall be a boltless, integral restraining system and shall be rated for 350 psi in accordance with the performance requirements of ANSI/AWWA C111/A21.11-17 Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

VALVES

Shall meet the requirements of ANSI/AWWA C509 Resilient-Seated Gate Valves. Valves shall be rated for 250 psi minimum working pressure. Valves shall be of full weight ductile iron body, bronze mounted resilient seat, non-rising stem type fitted with "O-Ring" seals. The operating nut shall be standard AWWA 2-inch square. Valves shall be mechanical joint equal to ANSI A21.11.

Gate valves shall be OPEN RIGHT, clockwise. Extension stems shall be provided where required, so that the operating nut is within 4-feet of finished grade. After the valves are installed and tested, a coat of asphalt varnish shall be applied on all exterior ferrous parts. Contractor shall submit to the Engineer the type of valve to be used for approval.

Interior coating will conform to ANSI/AWWA C550 Protective Interior Coatings for Valves and Hydrants.

APPURTENANCES (VALVES, HYDRANTS, CURB STOPS, ETC.)

Valve boxes, service boxes, corporation cocks, hydrants, air relief valves, yokes and tie-rods, curb stops, plugs, and any other materials which are required shall be of the latest Town of Lexington standard. The latest town standards are reflected on either the Plans, or the attached Standard Details. Air relief valves shall be installed at high points of the main or where and as directed.

CONSTRUCTION METHODS

SUBSECTION 301.60,
PART D. BRIDGING

Replace the entire subsection with the following:

Refer to Division II Section 850 “Traffic/Safety Controls”, and Division I Section 7.09 “Public Safety Conveniences” for requirements on traffic access for the Public; and pertinent laws regarding open trench excavation for requirements on legally and safely securing trenches during and after the work day.

PART F. REMOVAL OF CASTINGS

Inset the word "disposed," after the word "reset,"

PART G. LAYING PIPE

Delete the third paragraph in this section and replace with the following:

Push-on joints shall be installed in strict accordance with the manufacturer's instructions. Pipe shall be laid with bell ends looking ahead. A rubber gasket shall be inserted in the groove of the bell end of the pipe, and the joint surfaces cleaned and lubricated. The plain end of the pipe to be entered shall then be inserted in alignment with the bell of the pipe to which it is to be joined, and pushed home with a jack or by other means acceptable to the Engineer. After joining the pipe, a metal feeler shall be used to make certain that the rubber gasket is correctly located.

PART H. SETTING GATES AND HYDRANTS

Replace the entire section with the following:

Install hydrants, gates, boxes, and associated fittings in accordance with ANSI/AWWA C600 Installation of Ductile Iron Water Mains and Their Appurtenances, manufacturer's instructions, and as directed by the Engineer.

Center of hydrant pumper nozzle shall be not less than 18-inches above finished grade.

PART K. THRUST BLOCKS AND PIPE ANCHORS

Add the following to the end of the subsection:

Thrust restraints shall be installed in accordance with AWWA C600, and shall be installed at locations within the work at the direction of the Engineer.

The Lexington Water Department shall have the option to take ownership of any portion, whole or part, of hydrants scheduled to be removed and stacked. Any portion of the hydrant not selected by the Water Department to be kept will then become responsibility of the contractor to remove from the job site and dispose of in accordance with all local, state, and federal laws.

PART L. TESTING

Replace the entire subsection with the following:

The Contractor shall test all pipes, fittings, valves, hydrants and joints for leakage. The Contractor shall furnish all necessary equipment and labor for carrying out a pressure test and leakage test on the pipelines. The procedures for carrying out the pressure and leakage tests shall conform to AWWA C600 and be approved by the Engineer.

All pipelines shall be subjected to a hydrostatic pressure to a minimum of 200 psi at the point of lowest elevation and this pressure maintained for at least 120 minutes during which time there will be no pressure drop or leakage. In cases where the AWWA C600 testing procedure would require testing pressure greater than 200 psi, the Engineer may require testing in accordance with not more than the AWWA C600 hydrostatic pressure testing requirement.

PART M. DISINFECTION

Replace the entire subsection with the following:

The Contractor shall disinfect all newly installed water main. The Contractor shall furnish all necessary equipment and labor for carrying out disinfection. The procedure for carrying out the disinfection shall conform to AWWA C651.1 and be approved by the Engineer.

Insert the following Part after Part N of this subsection:

PART O. JOINING MECHANICAL JOINT

Mechanical joints at valves, fittings, and where designated shall be in accordance with the "Notes on Method of Installation" under ANSI Specification A 21.11 and the instructions of the manufacturer. To assemble the joints in the field, the Contractor shall thoroughly clean the joint surfaces and rubber gasket with soapy water before tightening the bolts. Bolts shall be tight to the specified torque. Under no conditions shall extension wrenches or pipe over handle or ordinary ratchet wrench be used to secure greater leverage.

Insert the following Part after Part O of this subsection:

PART P. DISPOSAL

Dispose of any materials required to be removed and disposed offsite in accordance with any state, local and federal laws.

Insert the following Part after Part P of this subsection:

PART Q. DEWATERING

Discharge from dewatering will be free and clear of turbidity before being introduced to surface waters or any part of the town’s drainage infrastructure. When dewatering of the work area is necessary the Contractor shall build a sump in the excavation area using clean stone, pumps, hoses and other tools and equipment necessary, at no additional cost to the owner. When deemed necessary by the Engineer the Contractor shall also filter discharge through approved silt bags or settle discharge in a settling tank or other structure, or by other methods previously approved by the Engineer, to further clean pumped water. Discharge velocity and location shall also be controlled by a technique approved by the Engineer to prevent scouring or other damage to the discharge location. Dewatering of the work area shall be considered incidental to items requiring excavation in groundwater.

Add this new subsection:

SUBSECTION 301.61 GAS GATES

It shall be the sole responsibility of the Contractor to coordinate with National Grid to have any and all gas gates adjusted to the proper grades or as directed by the Engineer. Unless otherwise directed by National Grid, it shall be the responsibility of National Grid to adjust said gates. In the case that an agreement is made with National Grid for the contractor to adjust the gas gates then compensation will be made to the Contractor by the Town under item 358.

COMPENSATION

SUBSECTION 301.80 METHOD OF MEASUREMENT

Replace this subsection in its entirety with the following:

Ductile iron pipe shall be measured completed in place, in linear feet and the quantity to be paid for shall be the actual length constructed minus the center line length of any valves, fittings, or other appurtenances.

Fittings shall be measured completed in place and shall consist of bends, tees, plugs, caps, wyes, crosses, reducers, tapping sleeves, mechanical thrust resistors, and the like shall be measured by weight in pounds. The weight of each fitting shall be the nominal weight listed for the type and size fitting used in the Handbook of Cast Iron Pipe, latest edition, under AWWA C110/A21.10 or the weight stated on the invoice of the supplier, whichever is less.

Water main and fittings shall be measured removed and stacked or removed and disposed in linear feet, and the quantity to be paid for shall be the actual length of pipe removed including the centerline length of fittings and other appurtenances, but not including gate valves.

Gate valves, hydrants, curb stops, and corporation stops shall be measured complete in place, per each.

One inch copper tubing for services shall be measured per linear foot in place.

Hydrants, gate boxes, and service boxes removed and reset or replaced shall be measured per each reinstalled complete in place in their new location. New hydrant shall be installed at existing location or relocated location as shown on the plans.

Hydrants, gate boxes, and curb boxes removed and stacked shall be properly stacked in the location designated by the Engineer.

Hydrants, gate boxes, and curb boxes removed and legal disposal from the site shall be incidental to water items.

Trench ledge excavation, and unsuitable material excavated below grade shall be consider incidental to the water items.

Measurement of water and gas gate boxes adjusted shall include all risers as necessary, up to a length of 12 inches.

Allowances shall be made for compensation to the Contractor for water mains, gates or services that are broken or disrupted during excavation within the trench limits as defined in the construction plans that have either been unmarked in the field or are located at a minimum of five (5) feet parallel to either the left or right of the water main, gate or service marking as laid out in the field. Such allowances for compensation shall be measured per each occurrence of the preceding scenario.

SUBSECTION 301.81 BASIS OF PAYMENT

Replace this subsection in its entirety with the following:

Ductile iron pipe shall be paid for at the contract unit price bid per linear foot of the kind, type, and size pipe required installed, complete in place. Bid price shall include all materials, equipment, and labor necessary to excavate for, install, and properly bed and backfill the pipe; disposing of excess excavated materials offsite; dewatering the work area, and testing and disinfecting per these specifications.

Ductile iron fittings shall be paid for at the contract unit price bid per pound, installed and complete in place. Bid price shall include all excavation and backfilling of the trench and all materials, labor, and equipment necessary to complete the installation.

Hydrants Reomved and Rest of Replaced shall be paid for at the contract unit price bid per each furnished and installed complete in place. The unit price bid for each hydrant shall include all excavation and backfilling, stone borrow and all other labor, materials, and equipment necessary to complete the installation. Care shall be taken during removal to preserve any appurtenances and segregate any specified stone and backfill material to be reused during reinstallation. Any new material required to reinstall the hydrant due to the Contractor's mishandling of the existing materials will be paid for at the Contractor's expense. Hydrants to be removed and reset shall be replaced with new hydrants at new or existing location as directed by the Engineer. Hydrant Reomved and Rest or Replaced under Item 376.2 or Item 376.21 inclusive of all material.

Gate valves shall be paid for at the contract unit price bid per each furnished and installed complete in place. Bid price shall include all excavation, backfilling, labor, materials, and equipment to complete the installation in accordance with the plans and specifications. Gate boxes shall be considered incidental to this item.

Corporation stops shall be paid for at the contract unit price bid per each furnished and installed complete in place. The bid price shall include all labor, materials, tools, and equipment necessary to complete the installation in accordance with the plans and specifications.

Copper tubing shall be paid for at the contract unit price bid per linear foot for each size indicated, furnished and ·installed, complete in place as shown on the plans or as directed. Bid price shall include all materials, equipment, and labor necessary to excavate for, install, and properly backfill the pipe; disposing of excess excavated materials offsite; dewatering the work area, and testing and disinfecting per these specifications. It shall also include removal and disposal of any existing water service up to 1" in diameter from main to the old curb stop or the right of way, whichever is greater.

Curb stops shall be paid for at the contract unit price bid per each furnished and installed complete in place together with a curb box. The bid price shall include all excavation and backfilling, labor, materials, and equipment necessary to complete the installation in accordance with the plans.

Hydrants, valve boxes, and curb boxes removed and stacked, or removed and disposed shall be considered incidental to water items.

Add the following at the end of this subsection:

All risers up to a length of 12 inches shall be considered incidental to the contract unit price for gate boxes adjusted, with no additional measurement or payment. If gate box needs replacement below 12" from final grade then payment will be made under item 357 for the excavation, disposal of materials, installation and proper backfilling and under item 358 for adjustment to final grade.

Allowances for compensation shall be paid per each occurrence as measured in Subsection 301.80.

SUBSECTION 301.82 PAYMENT ITEMS

Add the following payment items in numerical order:

ITEM 376.2	Hydrant Removed and Reset	Each
ITEM 376.21	Hydrant Removed and Replaced	Each

SECTION 402
DENSE GRADED CRUSHED STONE FOR SUB-BASE

CONSTRUCTION METHODS

SUBSECTION 402.61 SPREADING AND COMPACTING

Add the following at the end of this subsection:

The overall depth of the Gravel for Base Course layer shall be no greater than 8 inches after compaction.

COMPENSATION

SUBSECTION 402.80 METHOD OF MEASUREMENT

Add the following at the end of this Subsection:

When quantities of Dense Graded Crushed Stone for Sub-base are given in tons, a factor of 1.65 tons per cubic yard will be used to convert the measurement to cubic yards.

SECTION 500
CURBING AND EDGING

DESCRIPTION

SUBSECTION 501.20 GENERAL

Add the following at the end of this subsection:

Granite Curb shall be set in a concrete bed with asphalt patch as shown on the construction detail.

Sawcutting is required in advance of setting curb and is incidental to the item as described in subsection 501.8.

MATERIALS

SUBSECTION 501.40 GENERAL

Add the following at the end of this subsection:

M4	Cement Concrete (4,000 PSI)

CONSTRUCTION METHODS

SUBSECTION 501.65 FILLING ABOUT TRENCH

Replace this section with the following:

After the curb, curb corners, curb inlets, and edging is set, the space between it and the wall of the trench shall be filled to the height of the bottom of the existing asphalt layer (or as directed by Engineer if no existing asphalt) on front and back of curbing with cement concrete (M4-4,000 psi). The front (road side) of the curbing trench shall then be filled, with bituminous concrete installed in lifts no greater than two inches (2”) and thoroughly compacted, to top of existing asphalt.

COMPENSATION

SUBSECTION 501.80 METHOD OF MEASUREMENT

Add the following at the end of this subsection:

No additional measurement shall be made Cement Concrete installed as part of the installation of Granite Curb.

Bituminous Concrete shall be measured per ton installed and thoroughly compacted.

SUBSECTION 501.81 BASIS OF PAYMENT

Add the following at the end of this subsection:

Cement Concrete shall be considered incidental to the item for Granite Curb with no additional payment made.

Hot Mix Asphalt shall be paid per ton under Item 472 Temporary asphalt patching.

SUBSECTION 501.82 PAYMENT TERMS

Add the following at the end of this subsection:

ITEM 472. Temporary Asphalt Patching	TON

SECTION 670
SEDIMENTATION FENCE

Change the title of this Section to read:

SECTION 670
SEDIMENTATION FENCE AND COMPOST SOCK

DESCRIPTION

SUBSECTION 670.20 GENERAL

Add the following at the end of this subsection:

Sediment fences and/or compost sock shall be erected in all areas adjacent to wetland areas before any construction activity commences to prevent overflow of unsuitable materials into adjacent areas of streams.

The Contractor shall furnish and install degradable compost socks for perimeter berm at locations shown on the as directed by the engineer. Removal shall be inclusive to the item, and will be conducted as directed by the Engineer. The compost sock for perimeter berm shall be used as such and is not intended for areas which may receive concentrated flows such as channels or restricted outlets.

MATERIALS

SUBSECTION 670.40 MATERIALS

Replace the first sentence of this subsection with the following:

The siltation fence shall be a woven material and meet the following design criteria:

	Test Method	Values
Grab Strength	ASTM D-1682	90 lbs
Elongation	ASTM D-1682	15% min. 50% max. @ 45 lbs.
Permitivity	ASTM 4491	0.01 (Sec. 1)
EOS (sieve No.)	----	20
U.V. Resistance (500 hours exposure)	ASTM D-4355	70

The compost sock shall be a biodegradable material and meet the following design criteria:

- A mesh tube, oval to round in cross section, 12 inches in diameter. Sock must have a minimum durability of one year after installation.
- Composed of a knitted biodegradable or photodegradable material with 1/8 to 3/8 inch openings. Fabric must be clean; evenly woven; free of encrusted concrete or other contaminated materials; and free from cuts, tears, broken or missing yarns and thin, open, or weak places.

The compost media shall meet the following design criteria:

- Compost may be derived from green material consisting of chipped, shredded, or ground vegetation; or clean recycled wood products.
- Compost must not be derived from mixed municipal solid waste and be reasonably free of visible contaminates. Compost must not contain paint, petroleum products, pesticides or any other chemical residues harmful to animal life or plant growth. Compost must not possess objectionable odors. 2.3 Chemical, Physical and Biological Parameters.
- Compost products specified for use in this application must meet the criteria specified in Table 1, below.
- Only compost products that meet all applicable state and federal regulations pertaining to its production and distribution may be used in this application. Approved compost products must meet related state and federal chemical contaminant (e.g., heavy metals, pesticides, etc.) and pathogen limits pertaining to the feedstocks (source materials) in which it is derived.

Parameters	**Units of Measure**	**Characteristics**
pH2	pH units	5.0-8.5
Soluble salt concentration (electrical conductivity)	dS/m (mmhos/cm)	Maximum 5
Moisture Content	% wet weight basis	30-60
Organic Matter Content	% dry weight basis	25-65
Particle Size	% passing a selected mesh size, dry weight basis	3”, 100% passing 1”, 90% to 100% passing ¾”, 70% to 100% passing ¼”, 30% to 75% passing Maximum: particle size length of 6” (no more than 60% passing ¼” in high rainfall/flow rate situations)
Stability Carbon Dioxide Evolution Rate	Mg CO2-C per g OM per day	<8
Physical Contaminants (man-made inerts)	%, dry weight basis	<1

Note: The composition of this media is similar to the vegetated filter berm media from AASHTO R 51. Very coarse (woody) composts that contain less than 30% of fine particles (1mm in size) shall be avoided, as optimum reductions in total suspended solids (TSS) is desired and berms may be seeded.

Renumber subsection 670.40 to read 670.60.

CONSTRUCTION METHODS

SUBSECTION 670.60 CONSTRUCTION METHODS

Add the following at the end of this subsection:

Temporary sediment fences, or portions thereof, may be left in place at the discretion of the Engineer. Sediment fence shall not be removed until approved by the Conservation Commission and the Engineer.

Installation and maintenance of compost sock;

Site Preparation

To ensure optimum performance, cut down or remove heavy vegetation, and level uneven surfaces to ensure that the filter sock uniformly contacts the ground surface.

Installation

- Prior to installation, clear the area of obstructions including rocks, clods, and debris greater than one inch
- Fill socks uniformly with compost to the desired length such that the logs do not deform. Secure ends.
- When more than one compost sock is required to achieve desired length, join socks longitudinally with a 1 foot 6 inch overlap.
- Compost sock may be installed using installation method Type 1, Type 2, or a combination:
    - Installation method Type 1: – Place directly on the ground with good contact with the

finish grade. – Secure with wood stakes every 4 feet along the length of the compost sock. – Secure the ends of the compost sock by placing a stake 6 inches from the end of the compost sock. – Drive the stakes into the soil so that the top of the stake is less then 2 inches above the top of the compost sock.
    - Installation method Type 2: – Place directly on the ground with good contact with the finish grade. – Secure with rope and notched wood stakes. – Drive stakes into the soil until the notch is even with the top of the compost sock. – Lace the rope between stakes and over the compost sock. Knot the rope at each stake. – Tighten the compost sock to the surface of the slope by driving the stakes further into the soil.
- Install compost sock approximately parallel to the slope contour or as otherwise specified in the SWPPP or ordered by the Engineer.

Maintenance

- Inspect compost socks regularly, and after each rainfall event, to ensure that they are intact and functioning correctly. Remove sediment that builds up behind the sock before it interferes with the functionality of the sock. Deposit the removed sediment within the project limits so that the sediment is not subject to erosion by wind or by water.
- Repair or replace split, torn, or unraveling socks. Replace broken or split stakes. Sagging or slumping compost socks must be repaired with additional stakes or replaced. Correct locations where rills and other evidence of concentrated runoff have occurred beneath the socks. Compost socks must be repaired or replaced within 24 hours of identifying the deficiency.
- Remove sock mesh tubes when directed by the Engineer. Cut mesh and empty sock contents in place and rake to distribute evenly.

COMPENSATION

SUBSECTION 670.80 METHOD OF MEASUREMENT

Add the following at the end of this subsection:

Compost sock shall be measured per linear foot complete in place and shall include removal and disposal.

SUBSECTION 670.82 PAYMENT ITEMS

Add the following item:

697.1	Compost Sock	Linear Foot

Insert the following new section in numerical order:

SECTION 697
SILT SACK

DESCRIPTION

SUBSECTION 697.20 GENERAL

The work under this item shall conform to the relevant provisions of Section 670 of the Supplemental Specifications and the following:

Contractor shall provide and maintain silt sack at all existing catch basins within the project limits and as required by the Engineer.

MATERIALS

SUBSECTION 697.40 GENERAL

The silt sack shall be manufactured from a woven polypropylene fabric with an oil-absorbent pillow insert or made completely from an oil-absorbent fabric with a woven pillow insert that meets or exceeds the following specifications.

PROPERTIES	TEST METHOD	UNITS
Grab Tensile Strength	ASTM D-4632	265 LBS
Grab Tensile Elongation	ASTM D-4632	20%
Puncture	ASTM D-4833	135 LBS
Mullen Burst	ASTM D-3786	420 PS
Trapezoid Tear	ASTM D-4533	45 LBS
UV Resistance	ASTM D-4355	90%
Apparent Opening Size	ASTM D-4751	20 US SIEVE
Flow Rate	ASTM D-4491	200GAL/MIN/SQ FT
Permittivity	ASTM D-4491	1.5 SEC-1

All silt sacks must have an overflow to accommodate rain events.

CONSTRUCTION METHODS

SUBSECTION 697.60 GENERAL

The work under this item shall include the periodic maintenance of the sacks that have become clogged with debris. The Contractor shall keep silt sacks clear during construction and shall not remove them until pavement is in place and the seeded areas have taken root. The cost of replacing the silk sack shall be incidental to this item. No separate payment shall be for additional silt sacks used at a single location.

The Contractor shall be responsible for field measuring all existing and new drainage structures to ensure that the proper size sediment collection sack is provided for each structure.

Disposal of Accumulated Material

All material removed from the silt sacks shall be properly handled and disposed of by the Contractor in accordance with all Massachusetts Department of Environmental Protection (DEP) regulations, policies and guidelines.

Material removed shall be transported immediately to the place of disposal in machines or trucks that will not spill the material along the roadway. Any material falling on the roadway shall be removed at the Contractor's own expense.

NOTE: The Contractor should be aware that many landfills may require testing and analysis of the material prior to accepting it for disposal at the facility. The Contractor shall be aware that in the event that the test results indicate a hazardous waste that cannot be land filled. The Contractor shall be

responsible for all costs associated with adhering to special regulations regarding disposal of waste materials removed from silt sacks.

COMPENSATION

SUBSECTION 697.80 METHOD OF MEASUREMENT

Silt Sack will be measured for payment by the each, complete in place.

SUBSECTION 697.81 BASIS OF PAYMENT

Silt Sack will be paid for at the Contract unit price per each, which price shall include all labor, materials, equipment and incidental costs required to provide, install, maintain and remove silt sacks in locations required by the Engineer for the duration of the project.

SUBSECTION 697.82 PAYMENT ITEMS

ITEM 697.2	Silt Sack	Each

INTERIM SUBSECTION 701: CEMENT CONCRETE SIDEWALKS, PEDESTRIAN CURB RAMPS, AND DRIVEWAYS

DESCRIPTION

701.20: General

This work shall consist of the construction of cement concrete sidewalks, pedestrian curb ramps (wheelchair ramps), and driveways in accordance with the specifications and within the tolerances established on the plans.

MATERIALS

701.30: General

Materials shall meet the requirements specified in the following Subsections of Division III, Materials except as noted herein:

Gravel Borrow, Type b	M1.03.0
Cement Concrete (≥ 4,000 psi)	M4.02.00
Preformed Expansion Joint Filler	M9.14.0[1]

[1] Preformed expansion joint filler shall conform to Subsection M9.14.0 or ASTM D8139.

The following best practices may be incorporated into the cement concrete mix design at no additional cost to the Department as identified herein.

A. Combined Aggregate System.

The combined aggregate system for the mix design may be analyzed using the Tarantula Curve, Shilstone Chart, fineness modulus, and coarse aggregate content to enhance the properties of the concrete.

1. Tarantula Curve.

The combined aggregate system for the mix design may be analyzed using the Tarantula Curve to evaluate potential properties of the concrete, including workability, segregation, edge slumping, surface finishing, and cohesion.

Table 701.30-1: Tarantula Curve Particle Size Distribution

Sieve Opening	**Percent by Mass Targets (%)**		**Percent by Mass Retained (%)**		
	Passing	**Retained**			
1-1/2 in.	100	–	–	–	–
1 in.	92	8	0 – 16	–	–
3/4 in.	82	10	0 – 20	–	–
1/2 in.	69	13	4 – 20	–	–
3/8 in.	56	13	4 – 20	–	–
No. 4	43	13	4 – 20	–	–
No. 8	37	6	0 – 12	Coarse Sand 20 – 40	–
No. 16	31	6	0 – 12		–
No. 30	18	13	4 – 20		Fine Sand 24 – 34
No. 50	5	13	4 – 20	–	
No. 100	0	5	0 – 10	–	
No. 200	0	0	0 – 2	–	

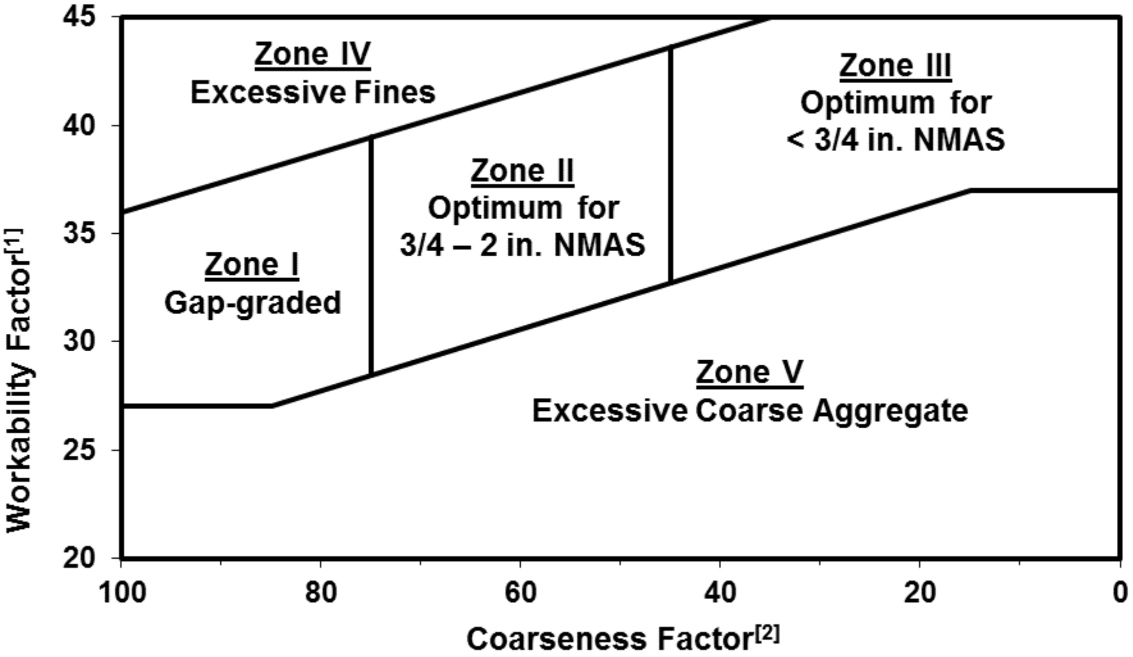
2. Shilstone Workability-Coarseness Chart.

The combined aggregate system for the mix design may be analyzed using the Shilstone Workability-Coarseness Chart, to evaluate potential properties of the concrete, including workability.

Table 701.30-2: Shilstone Workability-Coarseness

Zone	Property	Cause
Zone I	Gap-graded; High potential for segregation during placement and consolidation; Cracking, blistering, spalling, and scaling	Deficiency in intermediate particles; Non-cohesive
Zone II	Optimum mixture for nominal maximum aggregate size from 2 in. – ¾ in.	Optimized workability factor and coarseness factor
Zone III	Optimum mixture for nominal maximum aggregate size < ¾ in.	Optimized workability factor and coarseness factor
Zone IV	Sticky; High potential for segregation during consolidation and finishing; Variable strength, high shrinkage, cracking, curling, spalling, and scaling	Excessive fines
Zone V	Rocky; Lacking plasticity	Excessive amount of coarse and intermediate aggregate

Figure 701.30-1: Shilstone Workability-Coarseness Chart



[1] The workability factor is determined by the equation WF = W + (C - 564) / 38, where WF = workability factor, W = percent passing No. 8 sieve and C = total cementitious materials content.

[2] The coarseness factor is determined by the equation CF = (Q/R) / 100, where CF = coarseness factor, Q = cumulative percent retained on 3/8 in. sieve and R = cumulative percent retained on No. 8 sieve.

3. Fineness Modulus.

The combined aggregate system for the mix design may be analyzed using the fineness modulus, to evaluate potential properties of the concrete, including the fineness or coarseness of the mix design and estimating the design proportions of fine and coarse aggregates. The coarseness of the mix design increases as the fineness modulus increasers. The fineness modulus is determined by calculating the total cumulative percentages by mass retained on each designated sieve and dividing by 100.

4. Coarse Aggregate Content.

The combined aggregate system for the mix design may be analyzed using the coarse aggregate content. The coarse aggregate content is determined by calculating the total cumulative percentages by mass retained on the No. 4 sieve.

B. Paste System.

The quality of the paste system is determined by the water-cementitious ratio, air content, cementitious materials, and chemical admixtures incorporated into the mix design.

1. Water-Cementitious Ratio.

The water-cementitious ratio for the mix design may be analyzed to evaluate potential properties of the concrete, including strength, concrete and reinforcement bonding, and resistance to freezing, thawing, de-icing, sulfate reaction, corrosion of steel reinforcement, drying shrinkage, cracking, and volume change from wetting and drying. The water-cementitious ratio is determined by calculating the total water content by mass and dividing by the total cement and supplementary cementitious material (SCM) content by mass. The recommended water-cementitious ratio design target is identified in Table 701.30-3. The water-cementitious ratio shall be less than or equal to 0.45.

Table 701.30-3: Freezing, Thawing, and De-icing Resistance

Exposure Class	**Severity**	**Condition**	**Water-Cementitious Ratio**	
			Recommendation	**Requirement**
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	≤ 0.40	≤ 0.45

2. Air Content.

The air content for the mix design may be analyzed to evaluate potential properties of the concrete, including strength and resistance to freezing, thawing, de-icing, and sulfate reaction. The recommended air content design targets are identified in Table 701.30-4.

Table 701.30-4: Freezing, Thawing, and De-icing Resistance

Exposure Class	Severity	Condition	Nominal Maximum Aggregate Size (in.)	Air Content Target Recommendation (%)
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	3/8	7.5
			1/2	7.0
			3/4	6.0

3. Cement and Supplementary Cementitious Materials Content.

The cement and supplementary cementitious materials content incorporated into the mix design shall promote quality properties of the cement concrete, including resistance to alkali silica reaction, freezing, thawing, de-icing, and sulfate reaction. Incorporation of supplementary cementitious materials (SCM) in cement concrete may affect workmanship properties, including workability, bleed rate, setting time, and other properties. Adequate adjustments in Contractor workmanship practices, including placement, finishing, curing, and other construction practices shall be required to account for these changes in properties and to prevent scaling due to freezing, thawing, and de-icing cycles. The cement and supplementary cementitious materials content shall meet the design criteria identified in Table 701.30-5.

Table 701.30-5: Alkali Silica Reaction and Freezing, Thawing, and De-icing Resistance[1][2]

Exposure Class	Severity	Condition	Material	Replacement by Weight of Cement (%)
F3	Very Severe	Exposed to freezing and thawing cycles and accumulation of snow, ice, and de-icing chemicals; Frequent exposure to water	Low Alkali Cement (≤ 0.60% Alkalinity)	–
			Blended Hydraulic Cement[3]	–
			Fly Ash (Class F)	15 – 30
			Slag (Grade 100 or 120)	25 – 50
			Silica Fume	5 – 10
			Total SCM	≤ 50
			Total Fly Ash and Silica Fume	≤ 35

[1] Acceptable replacement by weight of cement for alkali silica reaction resistance shall be determined by the alkali silica reaction resistance performance test results and the criteria identified in Table 701.73-1: Minimum Acceptance Sampling and Testing Requirements.

[2] Test results meeting the alkali silica reaction resistance performance criteria of Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance Design Criteria may supersede the replacement by weight of cement design criteria.

[3] SCMs in blended hydraulic cement shall meet the criteria identified for fly ash, slag, and silica fume.

Table 701.30-6: Alternative Performance Evaluation to Alkali Silica Reaction Resistance Design Criteria

Method	Quality Characteristic	Criteria
C295	Petrographic Examination for Potential Alkali Aggregate Reactive Constituents and Deleterious Materials in Aggregate[1]	–
	Optically Strained, Microfractured or Microcrystalline Quartz (%)	≤ 5.0
	Chert or Chalcedony (%)	≤ 3.0
	Trydimite or Cristobalite (%)	≤ 1.0
	Opal (%)	≤ 0.5
	Natural Volcanic Glass (%)	≤ 3.0
T 380	Alkali Silica Reaction Resistance: Expansion of Miniature Concrete Prisms at 56 days (%)	≤ 0.03[2]

[1] Examination of aggregate shall be performed and reported to identify and quantify potential alkali-aggregate reactive constituents and deleterious materials in aggregate, as defined in ASTM C294 Standard Descriptive Nomenclature for Constituents of Concrete Aggregates and ASTM C295 Standard Guide for Petrographic Examination of Aggregates for Concrete.

[2] 56-day expansion results greater than 0.03 but less than or equal to 0.04 shall be considered non-reactive if the average two-week rate of expansion from day 56 to day 84 is less than or equal to 0.01%, otherwise, expansion results shall be considered reactive.

4. Chemical Admixtures.

Chemical admixtures may be incorporated into the mix design to enhance the properties of the concrete.

Table 701.30-7: Chemical Admixtures

Spec.	Type	Chemical Admixture	Properties
M 194	A	Water-Reducing	Increases Workability and Air Content; Decreases Water Demand (5 – 10%, 3 – 6 in. Slump)
	B	Retarding	Increases Initial and Final Setting Time, Air Content, Long-Term Strength; Offsetting of Accelerating Effect of Hot Weather; Decreases Early-Age Strength
	C	Accelerating	Increases Early-Age Strength; Decreases Initial and Final Setting Time
	D	Water-Reducing and Retarding	Type A and Type B Admixture Properties
	E	Water-Reducing and Accelerating	Type A and Type C Admixture Properties
	F	High Range Water-Reducing	Increases Workability (More Effective than Type A), Air Content, Early-Age Strength, and Ultimate Strength; Decreases Water Demand (12 – 40%, > 6 in. Slump) and Permeability
	G	High Range Water-Reducing and Retarding	Type F and Type B Admixture Properties
	S-SRA	Shrinkage Reducing	Increases Setting Time; Decreases Drying Shrinkage Cracking and Bleed Rate
	S-CRA	Crack Reducing	Decreases Cracking (More Effective than SRAs) and Crack Width
M 154	AEA	Air-Entraining	Increases Cohesion, Workability, Stabilization of Air Bubbles, Resistance to Freezing, Thawing, and De-icing, Resistance to Alkali-Reactive Environment, and Resistance to Sulfate Reaction
M 194[1]	MRWRA	Mid Range Water-Reducing	Type A and Type F Admixture Properties; Increases Workability (Especially Concrete with SCMs); Decreases Water Demand (6 – 12 %, 5 – 8 in. Slump)
C1622	CWA	Cold Weather	Increases Hydration Rate; Decreases Freezing Point of Mixing Water

[1] Mid range water-reducing admixtures (MRWRA) may meet either water-reducing (A) or high range water-reducing (F) admixture criteria.

5. Paste Content.

The paste content for the mix design may be optimized to enhance potential properties of the concrete, including workability, strength, permeability, and resistance to drying shrinkage and cracking and volume change from wetting and drying. The volume of paste should adequately fill the voids and provide sufficient separation between the aggregate particles to promote workability and effective bonding of particles.

Table 701.30-8: Paste Content

Mix Design Characteristic	Recommendation
Volume of Cement Concrete (cf)[1]	27
Paste Content (%)[2]	≤ 28[3]
Paste Content to Aggregate Void Content Ratio[4]	1.25 – 1.75
Excess Volume of Paste for Workability (%)[5]	–

[1] The volume of cement concrete is determined by the following equation, where W = Weight (lbs.), SG = Specific Gravity, D = Density (pcf), and V = Volume (cf).

$$V_{CEMENT} = W_{CEMENT} / SG_{CEMENT} * D_{WATER}$$

$$V_{SCM} = W_{SCM} / SG_{SCM} * D_{WATER}$$

$$V_{ADMIXTURE} = V_{ADMIXTURE} \text{ in oz.} / 957.5 \text{ oz. per cf}$$

$$V_{WATER} = V_{WATER} \text{ in gal.} / 7.48 \text{ gal. per cf}$$

$$V_{COARSE} = W_{COARSE} / SG_{COARSE} * D_{WATER}$$

$$V_{FINE} = W_{FINE} / SG_{FINE} * D_{WATER}$$

$$V_{CONCRETE} = V_{CEMENT} + V_{SCM} + V_{ADMIXTURE} + V_{WATER} + V_{COARSE} + V_{FINE} + V_{AIR}$$

[2] The paste content by volume of cement concrete is determined by the following equation, where V = Volume (cf) and PC = Paste Content (%).

$$V_{PASTE} = V_{CEMENT} + V_{SCM} + V_{ADMIXTURE} + V_{WATER}$$

$$PC_{CONCRETE} = V_{PASTE} / V_{CONCRETE}$$

[3] The cracking tendency of structural concrete is significantly reduced when the paste content by volume is less than or equal to 28 percent.

[4] The paste content to aggregate void content ratio is determined by the following equation, where D = Density (pcf), SG = Specific Gravity, BD = Bulk Density (pcf), VC = Void Content (%), V = Volume (cf), AVC = Aggregate Void Content (%), PC = Paste Content (%), and R = Ratio. Workability increases as the paste content to aggregate void content ratio increases. Decreased paste content to aggregate void content ratios will result in decreased workability, where water-reducing admixtures provide no benefit.

$$VC_{\text{COARSE}} = SG_{\text{COARSE}} * D_{\text{WATER}} - BD_{\text{COARSE}} / D_{\text{COARSE}}$$

$$VC_{\text{FINE}} = SG_{\text{FINE}} * D_{\text{WATER}} - BD_{\text{FINE}} / D_{\text{FINE}}$$

$$VC_{\text{AGGREGATE}} = [(V_{\text{COARSE}} / (V_{\text{COARSE}} + V_{\text{FINE}})) * VC_{\text{COARSE}} + (V_{\text{FINE}} / (V_{\text{COARSE}} + V_{\text{FINE}})) * VC_{\text{FINE}}]$$

$$AVC_{\text{CONCRETE}} = [VC_{\text{AGGREGATE}} * ((V_{\text{COARSE}} + V_{\text{FINE}}) / V_{\text{CONCRETE}})]$$

$$R_{\text{PC-AVC}} = PC_{\text{CONCRETE}} / AVC_{\text{CONCRETE}}$$

[5] The excess paste content for workability is determined by the following equation, where PC = Paste Content (%), AC = Air Content (%), AVC = Aggregate Void Content (%), and EPC = Excess Paste Content for Workability (%).

$$EPC_{\text{CONCRETE}} = PC_{\text{CONCRETE}} + AC_{\text{CONCRETE}} - AVC_{\text{CONCRETE}}$$

C. Initial Curing Materials.

The materials and procedures used for initial curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

Cement concrete with a low to negligible bleeding rate, exposure to highly evaporative environments, high content of silica fume, fine cement, or other fine cementitious material, low water to cementitious ratio, high air content, or water-reducing admixtures have an increased susceptibility to surface drying and plastic shrinkage between placement and finishing operations. Initial curing materials and procedures shall be applied immediately after the bleed water sheen has disappeared from the surface of the concrete or the concrete surface exhibits loss of moisture and surface drying, between placement and finishing operations. Initial curing materials shall not be worked into the surface in subsequent finishing operations.

1. Liquid-Applied Evaporation Reducers.

Liquid-applied evaporation reducers used for initial curing methods shall produce an effective monomolecular film over the bleed water layer, to reduce the rate of evaporation of the bleed water from the surface and plastic shrinkage when the evaporation rate equals or exceeds the bleeding rate.

D. Intermediate Curing Materials.

The materials and procedures used for intermediate curing methods of cement concrete shall meet the Manufacturer's instructions and recommendations and the requirements specified herein.

In instances where finishing operations have been completed prior to the concrete achieving final set and the concrete surface exhibits loss of moisture and surface drying, the following curing materials and procedures shall be applied immediately to the concrete surface prior to the application of final curing materials, to prevent the loss of moisture without damaging the concrete surface, until final set of the concrete has been achieved and final curing materials have been applied to the concrete surface.

- 701.30.C.1: Liquid-Applied Evaporation Reducers
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

E. Final Curing Materials.

The materials and procedures used for final curing methods of cement concrete shall meet the Manufacturer’s instructions and recommendations and the requirements specified herein.

Curing water shall be free of deleterious impurities, causing staining and deterioration. The potential staining ability of curing water shall be evaluated by means of CRD-C401 (US Army Corps of Engineers 1975) for instances where curing water quality is questioned. Curing water shall not exceed a temperature differential of more than 20°F from the internal concrete temperature, to prevent cracking due to temperature gradients causing strain that exceeds the strain capacity of concrete. Curing water shall remain above freezing temperatures throughout the duration of the curing cycle.

Final curing materials and procedures shall be applied to the concrete surface immediately after application of initial and intermediate curing materials, finishing operations, and final set of cement concrete, to prevent the loss of moisture and surface drying.

Materials used for final curing methods of cement concrete shall accommodate all exposed cement concrete surfaces with a continuous application of moisture throughout the entire duration of the final curing method cycle and provide controlled and gradual termination of the final curing method cycle.

Final curing materials applied to the concrete shall allow the concrete to mature sufficiently to achieve its designed and desired properties, including strength, volume stability, permeability, durability, and resistance to freezing, thawing, and de-icing cycles. Insufficient application of final curing materials results in decreased strength and durability of the top surface of concrete.

Protection to the concrete surface and curing materials shall be required in instances where adverse weather conditions are present, until curing operations can be initiated without damaging the surface of the concrete.

Final curing materials and procedures shall be applied to the concrete surface throughout the entire duration of the curing cycle and meet minimum sustained temperature, duration, and strength requirements, as specified in applicable Division II: Construction Details and herein. Controlled and gradual termination of the final curing method cycle shall begin only after all specified conditions are met, until the concrete gradually cools to within 20°F of the ambient temperature.

1. Saturated Covers.

Saturated covers used for final curing methods shall meet AASHTO M 182, Class 3. Saturated covers shall be in good condition, free from holes, tears, or other defects that would render it unsuitable for curing cement concrete and cementitious materials. Saturated covers shall be dried to prevent mildew when storing. Prior to application, saturated covers shall be thoroughly rinsed in water and free of harmful substances that are deleterious or cause discoloration to cement concrete and cementitious materials. Saturated covers shall have sufficient thickness and proper positioning onto the surface to maximize moisture retention. Saturated covers shall contain a sufficient amount of moisture to prevent moisture loss from the surface of cement concrete and cementitious materials. Saturated covers shall have the ability to retain sufficient moisture from continuous watering so that a film of water remains on the surface of cement concrete and cementitious materials throughout the entire duration of the final curing method cycle. Saturated covers shall not absorb water from cement concrete and cementitious materials. Polyethylene film may be applied over the saturated cover to limit the amount of continuous watering required for sufficient moisture retainage. Saturated covers shall accommodate uniform and slow drying of cement concrete and cementitious materials surfaces immediately prior to removal.

2. Sheet Materials.

Sheet materials, including polyethylene film, white burlap-polyethylene sheeting, and reinforced paper, used for final curing methods shall meet ASTM C171 and the requirements specified herein. Sheet materials shall inhibit moisture loss and reduce temperature rise in concrete exposed to radiation from the sun during the final curing method cycle. Adjoining covers shall overlap not less than 12 inches. All edges of the sheet materials shall be secured to maintain a moist environment.

a. Polyethylene Film.

Polyethylene film shall be clear, white, or black in color and consist of a single sheet manufactured from polyethylene resins, be free of visible defects, including tears, wrinkles, and discontinuity. The film shall prohibit mottling and uneven spots from appearing on the surface of concrete, due to variations in temperature, moisture content, or both. Application of additional curing water under the film or application of a polyethylene film bonded to absorbent fabric to the concrete surface may be required to prevent mottling and to retain and evenly distribute the moisture. Polyethylene film shall accommodate concrete surfaces with constant contact without damage. The film shall be sufficient in length to extend beyond the edges of the concrete surface. Edges of adjacent polyethylene film shall overlap a minimum of 6 inches and be tightly sealed with the use of sand, wood planks, pressure-sensitive tape, mastic, or glue to maintain close contact with the concrete surface, retain moisture, and prevent the formation of air pockets throughout the entire duration of the final curing method cycle.

i. White Polyethylene Film.

White polyethylene film shall minimize heat gain caused by absorption of solar radiation and shall be exclusively used during warm weather applications.

ii. Clear and Black Polyethylene Films.

Clear and black polyethylene films shall inhibit absorption of solar radiation for cold weather applications.

b. White Burlap-Polyethylene Sheeting.

White burlap-polyethylene sheeting shall be securely bonded to the burlap so to avoid separation of the materials during handling and curing of the concrete.

c. Reinforced Impervious Paper.

Reinforced impervious paper shall be white in color, consist of two sheets of kraft paper cemented together with a bituminous adhesive, and reinforced with embedded cords or strands of fiber running in both directions. Reinforced impervious paper shall be free of holes, tears, and pin holes from deterioration of the paper through repeated use. Reinforced impervious paper shall be treated to prevent tearing when wetted and dried. Reuse of reinforced impervious paper shall be permitted so long as it is able to retain moisture on the surface of concrete. The paper shall be discarded and prohibited from use when moisture is no longer retained in the material.

3. Liquid Membrane-Forming Compounds.

Compounds shall form a continuous, non-yellowing, and durable film with quality moisture-retention properties. Compounds shall maintain the relative humidity of the concrete surface above 80% for seven days to sustain cement hydration. Compounds shall not affect the original color of the concrete surface. Compounds shall not degrade due to exposure to ultraviolet light from direct sunlight. Compounds shall meet the local and federal allowable Volatile Organic Compound (VOC) content limits.

White-pigmented compounds shall be used in instances where solar-heat gain is concern to the concrete surface. White-pigmented compounds shall be agitated in the container prior to application to prevent pigment from settling out resulting in non-uniform overage and ineffective curing.

Careful considerations shall be made by the Contractor to determine if the evaporation rate is exceeding the rate of bleeding, thus causing the surface to appear dry even though bleeding is still occurring. To diagnose and prevent this condition, the Contractor may place a transparent plastic sheet over a test area of the uncured and unfinished concrete surface and shall determine if any bleed water accumulates under the plastic. Under such conditions, the application of liquid membrane-forming compounds to the concrete surface shall be delayed to prevent bleed water from being sealed below the concrete surface, map cracking of the membrane films, reduction in moisture-retention capability, and the need for reapplication of the compound.

Prior to use, compounds shall be thoroughly mixed, stirred, and agitated per the Manufacturer’s instructions and recommendations.

Compounds shall be applied continuously and uniformly to the surface of the concrete per the Manufacturer’s instructions and recommendations. Compounds shall be applied immediately after the disappearance of the surface water sheen following final finishing. Applicating of the compound immediately after final finishing and before all free water on the surface has evaporated will help prevent the formation of cracks. When using compounds to reduce moisture loss from formed surfaces, the exposed surface shall be wetted immediately after form removal and kept moist until the curing compound is applied. The concrete shall be allowed to reach a uniformly damp appearance with no free water on the surface, and then application of the compound shall begin at once. Delayed application will result in surface drying, absorption of the compound into the concrete, and no forming of a continuous membrane.

The concrete surface shall be damp when the compound is applied. Power-driven spray equipment shall be used for uniform application of compounds on large paving projects. Spray nozzles recommended by the compound Manufacturer and use of windshields shall be arranged by the Contractor to prevent wind-blown loss of compound and to ensure proper coverage application rates are achieved. The compound shall be applied by power sprayer, using appropriate wands and nozzles with pressures between 25 and 100 psi. The Contractor shall fill the power sprayer with curing compound from the Manufacturer’s original container in the presence of the Engineer. Any dilution as recommended by the Manufacturer shall take place in the presence of the Engineer. For very small areas such as repairs, the compound shall be applied with a wide, soft-bristled brush or paint roller.

The Contractor shall verify the application rate and procedures are in accordance with the Manufacturer’s instructions and recommendations. At least one uniform coat shall be applied at a rate of 150 to 200 ft2/gallon. On very deeply textured surfaces, the surface area to be treated shall be at least twice the surface area of the surface. In such cases, two separate applications may be needed, each at 200 ft2/gallon or greater if specified by the Manufacturer to achieve the desired moisture retention rate, with the first being allowed to become tacky before the second is applied. If two coats are necessary to ensure complete coverage, for effective protection the second coat should be applied at right angles to the first. Complete coverage of the surface shall be attained due to the potential for formation of small pinholes in the membrane, which will result in loss of moisture from the concrete. Compounds shall not sag, run off peaks, or collect in grooves.

Compounds and procedures shall be compatible with concrete surfaces receiving subsequent applications or placements of concrete, overlays, coatings, paints, sealers, finishes or other toppings to ensure acceptable bonding to the concrete. Testing to establish compatibility among the curing compound, subsequent surface treatments, concrete moisture content and the actual finished surface texture of the concrete shall be conducted when compatibility is not known. The compound Manufacturer shall be consulted by the Contractor to determine the compatibility of the application. Compounds shall not be applied to concrete surfaces where bonding of subsequent applications or placements is incompatible or is of concern. The use of wax-based curing compounds shall be prohibited in instances where concrete surfaces are subject to additional toppings and vehicular, pedestrian, or other traffic. Deliberate removal of compounds in the presence of the Engineer and in accordance with Manufacturer’s instructions and recommendations shall be conducted as an alternative to compatibility testing, incompatibility, or in instances where bonding is of concern. Bonding of subsequent materials may still be inhibited by the presence of the compound even after the moisture retention characteristics of the compound have diminished.

a. Liquid Membrane-Forming Compounds for Curing.

Liquid membrane-forming compounds for curing shall meet ASTM C309, the Manufacturer’s instructions and recommendations, and the requirements specified herein.

Table 701.30-1: Types of Compounds for Curing

Type	Description
Type 1	Clear or translucent without dye
Type 1-D	Clear or translucent with fugitive dye
Type 2	White pigmented

Table 701.30-2: Composition Class of Compounds for Curing

Type	Description
Class A	Unrestricted composition, generally wax-based products
Class B	ASTM D883 resin-based products

b. Liquid Membrane-Forming Compounds for Curing and Sealing.

Liquid membrane-forming compounds for curing and sealing shall meet ASTM C 1315, the Manufacturer’s instructions and recommendations, and the requirements specified herein.

In addition to moisture-retention capabilities compounds shall exhibit specific properties, including alkali resistance, acid resistance, adhesion-promoting quality, and resistance to degradation by ultraviolet light.

Table 701.30-3: Types of Compounds for Curing and Sealing

Type	Description
Type I	Clear or translucent
Type II	White pigmented

Table 701.30-4: Class of Compounds for Curing and Sealing

Type	Description
Class A	Non-yellowing

F. Protective Sealing Compounds.

Protective sealing compounds shall maintain valid listing on the Department Qualified Construction Materials List (QCML) and meet AASHTO M 224, NCHRP Report 244 and the requirements specified herein.

Protective sealing compounds shall sufficiently penetrate the concrete to seal the surface pores and fill the capillaries of the concrete by chemically reacting with the concrete and forming a hydrophobic layer. Protective sealing compounds shall limit the penetration of liquids, gases, and harmful substances into hardened concrete, including water, de-icing agents, and carbon dioxide to protect concrete from freezing, thawing, and de-icing cycles, corrosion of reinforcing steel, and acid attack. Protective sealing compounds shall limit the buildup of vapor pressure between the concrete and the applied sealer. Protective sealing compounds shall retard the penetration of harmful substances into hardened concrete. Protective sealing compounds shall maintain their protective properties during environmental exposure to freezing, thawing, and de-icing cycles. Protective sealing compounds shall not reduce the frictional properties of the concrete. Protective sealing compounds shall not affect the original color of the concrete surface if maintaining the original color is desired by the Department. Protective sealers shall meet the local and federal allowable Volatile Organic Compound (VOC) content limits.

Curing methods conforming to Department specifications shall be applied to the concrete prior to the application of protective sealers. Protective sealers shall not be applied to the concrete for a minimum of 28 days after placement and the surface shall be sufficiently prepared, clean, and dry for at least 24 hours with ambient temperatures exceeding 60°F. Protective sealers shall not be applied to concrete placed where freezing, thawing, and de-icing cycles are expected immediately after, due to the retainage of water in the concrete. Periodic re-application shall be required for protective penetrants requiring multiple applications and for concrete surfaces exhibiting wear to ensure long-term protection of the concrete surface.

G. Cold Weather Concreting Materials.

Cold weather concreting shall be defined as the procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete during cold weather conditions, while exposed to air temperatures falling below, or expected to fall below 40°F.

The protection period shall be defined as the minimum duration required to prevent concrete from the negative effects of cold weather exposure. The protection period shall remain in place while cold weather conditions exist. Controlled and gradual termination of the protection period shall be conducted only after 100% f’c is attained and all specified conditions are met.

The procedures, operations, materials, and equipment selected for cold weather concreting shall adequately maintain specified temperature ranges by addressing all variables, including ambient weather conditions, geometry of the structure, and mix design proportions. Concrete temperatures for cold weather concreting shall meet Table 701.30-5.

Table 701.30-5: Concrete Temperature Requirements for Cold Weather Concreting

Phase	Cold Weather Temperature (°F)	Concrete Temperature (°F)
Mixing	30-39	60-75
	0-30	65-80
	< 0	70-85
Placement	< 40	55-75
Protection Period	< 40	55-75
Termination of Protection Period – Allowable Rate of Decrease in 24 Hours	< 40	≤ 50

Cold weather concreting procedures, operations, materials, and equipment shall be developed and performed to prevent damage to concrete due to freezing at early ages, to ensure that the concrete develops the recommended strength for safe removal of forms, to maintain curing conditions that promote quality strength and durability development, to limit rapid temperature fluctuation, and to provide protection consistent with intended serviceability of the structure. The Contractor shall develop and submit to the Department for review and approval, cold weather concreting procedures for the mixing, delivery, placement, finishing, curing, and protection of concrete during cold weather, including:

- Procedures for protecting the subgrade from frost and the accumulation of ice or snow on reinforcement or forms prior to placement
- Methods and requirements for cold weather protection and temperature control of constituent materials incorporated into the mix design
- Chemical admixtures incorporated into the mix design for cold weather protection and temperature control
- Methods and requirements for cold weather protection and temperature control during mixing, delivery, placement, finishing, curing, and protection period
- Curing methods to be used during and following the protection period
- Types of covering, insulation, heating, or enclosures to be provided
- Methods for verification of in-place strength
- Procedures for measuring and recording concrete temperatures
- Procedures for preventing drying during dry, windy conditions

All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

1. Insulating Materials.

Insulating materials used for cold weather concreting shall meet the requirements specified herein. The thermal resistance of the proposed insulation system shall be determined to meet the concrete temperature range requirements specified herein. Supplemental heat, including hydronic heating systems, shall be applied in instances where insulating materials cannot achieve the concrete temperature requirements.

2. Heaters.

Heaters used for cold weather concreting including direct fired, indirect fired, and hydronic heaters shall meet ANSI A10.10 carbon monoxide limits, safety regulations for ventilation, and the stability, operation, fueling, and maintenance of heaters and the requirements specified herein.

a. Direct Fired Heaters.

Direct fired heaters generate heat to an enclosed space through the combustion of fossil fuels, including oil, kerosene, propane, gasoline, and natural gas. Hot air comprised of carbon dioxide and carbon monoxide combustion products, is discharged into the enclosed space. Direct fired heaters shall be prohibited from heating the air directly surrounding the concrete surface due to calcium carbonate formation interfering with the hydration reaction, from the reaction between the carbon dioxide generated from the combustion of fossil fuels and the calcium hydroxide on the surface of freshly placed concrete, resulting in a soft, chalky, and nondurable concrete surface. Direct fired heaters shall only be used on concrete surfaces protected from fossil fuel combustion products.

b. Indirect Fired Heaters.

Indirect fired heaters generate heat to an enclosed space through the combustion of fossil fuels, including oil, kerosene, propane, gasoline, and natural gas. The carbon dioxide and carbon monoxide combustion products are expelled through venting, resulting in clean heated air discharged into the enclosed space. Indirect fired heaters are suitable for heating the air directly surrounding the concrete surface.

c. Hydronic Heaters.

Hydronic heaters generate heat to an enclosed space through the circulation of the heat-transfer fluid in a closed system of pipes or hoses. The heat-transfer fluid is comprised of a propylene glycol water solution and is heated through the combustion of fossil fuels, including diesel fuel and kerosene. The combustion of fossil fuel occurs outside of the enclosed space and does not expose the concrete surface to the deleterious effects of carbon dioxide.

After the concrete placement achieves final set, polyethylene film or other suitable material shall sufficiently serve as a vapor barrier. The heat-transfer hoses shall be placed on top of the vapor barrier and covered with insulating materials meeting 701.30.G.1. Hydronic heaters shall be used to thaw or preheat subgrades prior to concrete placement and provide supplementary heat to insulating materials. Hydronic heaters shall provide an even distribution of heat to prevent curling and cracking induced by temperature gradients within concrete.

3. Enclosures.

Enclosures shall be made of wood, canvas tarpaulins, polyethylene film, or prefabricated rigid plastic. Enclosures shall be airtight, block wind, prevent admittance of cold air, conserve heat, and withstand wind and snow loads. Enclosures shall provide adequate headroom for craftsmen and sufficient space between the concrete and the enclosure to permit free circulation of warm air. Supplementary heat shall be supplied to enclosures by hydronic heaters, live steam, hot forced air, or indirect fired combustion heaters. Icing along the perimeter of the enclosure shall be prevented when live steam is utilized. Heaters and ducts shall be positioned to prevent the hot, dry air from overheating or drying the concrete surface. Insulating materials meeting 701.30.G.1 shall be applied as a vapor barrier to the concrete surface immediate after final set is attained.

H. Hot Weather Concreting Materials.

Hot weather concreting shall be defined as the procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, bleed water evaporation, curing, and protection of concrete during hot weather conditions, while exposed to air temperatures exceeding, or expected to exceed 80°F; concrete temperatures approaching, or expected to approach 90°F; evaporation rates of surface water approaching, or expected to approach the bleeding rate of the concrete; high solar radiation; low relative humidity; and high wind speed.

The protection period shall be defined as the minimum duration required to prevent concrete from the negative effects of hot weather exposure, including the acceleration of rate of moisture loss and rate of cement hydration, difficulties in curing, increased concrete temperature, increased water demand, accelerated slump loss, increased rate of setting, increased tendency for plastic shrinkage and thermal cracking, increased potential for cold joints, and difficulties in controlling entrained air content. The protection period shall remain in place while hot weather conditions exist. Controlled and gradual termination of the protection period shall be conducted when conditions permit. The allowable rate of temperature decrease shall not exceed 5°F per hour and meet the allowable rate of temperature decrease specified in 701.30.G: Cold Weather Concreting Materials.

The procedures, operations, materials, and equipment selected for hot weather concreting shall adequately maintain specified temperature ranges and evaporation rates by addressing all variables, including ambient weather conditions, geometry of the structure, and mix design proportions. Initial materials meeting 701.30.C: Initial Curing Materials shall be applied to the concrete surface while the concrete and air temperatures, relative humidity of the air, and the wind speed have the capacity to evaporate free water from the fresh concrete surface at a rate that is equal to or greater than bleeding rate of the concrete. The evaporation rate of surface water shall be determined by the following equation:

$$E = (T_c^{2.5} - r * T_a^{2.5})(1 + 0.4V) \times 10^{-6}$$

where E = evaporation rate of water-covered surface (lb/ft^2/hr), T_c = concrete temperature of the evaporating surface (°F), r = relative humidity of air surrounding the evaporating surface (%), T_a = temperature of the air surrounding the evaporative surface (°F), and V = average wind speed 20 inches above the evaporating surface. The air surrounding the evaporating surface shall be defined as the air approximately 4 to 6 feet above the evaporating surface on the windward side and shielded from the sun's rays.

Hot weather concreting procedures, operations, materials, and equipment shall be developed and performed to prevent damage to concrete and promote long-term durability. The Contractor shall develop and submit to the Department for review and approval, hot weather concreting procedures for the mixing, delivery, placement, finishing, curing, and protection of concrete during hot weather, including:

- Procedures for preparing the subgrade prior to placement
- Methods and requirements for hot weather protection and temperature control of constituent materials incorporated into the mix design
- Chemical admixtures incorporated into the mix design for hot weather protection and temperature control
- Methods and requirements for hot weather protection and temperature control during mixing, delivery, placement, finishing, curing, and protection period
- Initial curing methods to be used to reduce surface evaporation
- Curing methods to be used during and following the protection period
- Types of covering, insulation, cooling, or enclosures to be provided
- Evaporation rate and bleeding rate of concrete calculations
- Procedures for measuring and recording concrete temperatures
- Procedures for preventing drying during dry, windy conditions

All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

CONSTRUCTION METHODS

701.40: Pre-Placement

A. Excavation.

Excavation of the area shall be in accordance with the applicable portions of Subsection 120: Excavation.

B. Subgrade and Subbase.

The subgrade for the sidewalks and driveways shall be shaped parallel to the proposed surface of the sidewalks and driveways and thoroughly compacted. All depressions in the subgrade shall be filled with suitable material and again compacted until the surface is smooth and hard. Prior to the placement of the subbase, the Contractor shall inspect the prepared subgrade to ensure that it is in conformance with the required grade and cross-section. Subgrade shall be fine graded to meet the applicable requirements of Subsection 170: Grading.

After the subgrade has been prepared, a gravel subbase shall be placed upon it. After being compacted thoroughly, the subbase shall be at least 8 inches thick and parallel to the proposed surface of the sidewalk. Prior to the placement of the cement concrete, the Contractor shall inspect the prepared subbase material to ensure that it is in conformance with the required grade and cross-section. Subbase material that is not in accordance with the plans or specifications shall be reworked or replaced to meet the applicable requirements of Subsection 170: Grading before the start of cement concrete placement. When placing cement concrete, the compacted subbase shall not be frozen or have standing water.

C. Forms.

Side forms and transverse forms shall be smooth, free from warp, of sufficient strength to resist springing out of shape, of a depth to conform to the thickness of the proposed sidewalk or pedestrian curb ramp and of a type satisfactory to the Engineer.

All mortar or dirt from previously used forms shall be completely removed prior to use. The forms shall be well staked and thoroughly graded and set to the established lines with their upper edge conforming to the grade of the finished sidewalk or pedestrian curb ramp which shall have sufficient pitch to the roadside edge to provide for surface drainage.

All pedestrian curb ramp joints and transition sections which define grade changes shall be formed staked and checked for dimension, grade and slope conformance prior to placing cement concrete.

All forms shall be oiled before placing concrete.

701.41: Placement

The concrete shall be placed in alternate slabs 30 ft long except as otherwise ordered. The slabs shall be separated by transverse preformed expansion joint filler ½ in. thick.

Preformed expansion joint filler shall be placed adjacent to or around existing structures as directed.

Detectable warning panels conforming to the plans shall be securely incorporated into the work by means acceptable to the Engineer.

On the foundation as specified above, the concrete shall be placed in such quantity that after being thoroughly consolidated in place it shall be 4 in. deep. At driveways, the sidewalks shall be 6 in. deep.

In conveying the concrete from the place of mixing to the place of deposit, the operation shall be conducted in such a manner that no mortar will be lost, and the concrete shall be so handled that the concrete will be of uniform composition throughout, showing neither excess nor lack of mortar in any one place.

The surface of all concrete sidewalks shall be uniformly scored into block units of areas not more than 36 ft^2. The depth of the scoring shall be at least ½ in. deep and no more than ½ in. wide.

701.42: Initial Curing

In instances where the bleed water sheen has disappeared from the surface of the concrete or the concrete surface exhibits loss of moisture and surface drying between placement and finishing operations, the

Contractor shall apply one of the following initial curing materials and procedures meeting 701.30.C: Initial Curing Materials until finishing operations occur.

- 701.30.C.1: Liquid-Applied Evaporation Reducers

Initial curing materials shall not be worked into the surface in subsequent finishing operations.

701.43: Finishing

The finishing of concrete surface shall be done by experienced and competent cement finishers. No finishing operation shall be performed while free water is present. Finishing operations shall be delayed until all bleed water and water sheen has left the surface and the concrete has started to stiffen. After water sheen has disappeared, edging operations, where required, shall be completed. After edging and joining operations, the surface shall be floated. Magnesium floats shall be used for all finishing operations. If necessary tooled joints and edges shall be rerun before and after floating to maintain uniformity. After floating, the surface shall be brushed by drawing a soft-bristled push broom with a long handle over the surface of the concrete to produce a nonslip surface.

701.44: Intermediate Curing

In instances where finishing operations have been completed prior to the concrete achieving final set and the concrete surface exhibits loss of moisture and surface drying, the Contractor shall apply one of the following intermediate curing materials and procedures meeting 701.30.D: Intermediate Curing Materials immediately to the concrete surface prior to the application of final curing materials, to prevent the loss of moisture without damaging the concrete surface, until final set of the concrete has been achieved and final curing materials have been applied to the concrete surface.

- 701.30.C.1: Liquid-Applied Evaporation Reducers
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

701.45: Final Curing

The Contractor shall apply one of the following final curing materials and procedures meeting 701.30.E: Final Curing Materials to the concrete surface immediately after application of initial and intermediate curing materials, finishing operations, and final set of cement concrete, to prevent the loss of moisture and surface drying.

- 701.30.E.1: Saturated Covers
- 701.30.E.2: Sheet Materials
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing
- 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing

The Contractor shall apply final curing materials and procedures to the concrete surface throughout the entire duration of the curing cycle and meet minimum sustained temperature, duration, and strength requirements, as specified in in Table 701.45-1. Controlled and gradual termination of the curing cycle shall begin after all specified conditions are met.

Table 701.45-1: Termination of Curing Cycle

Sustained Concrete Temperature	Final Curing Cycle Duration	Compressive Strength[1]
50°F ≤ °F ≤ 90°F	≥ Seven (7) days	≥ 70% f'_c

[1] Compressive strength cylinders for termination of curing cycle shall be cast and field cured with the same environmental conditions that the sidewalk is subjected to throughout the entire duration of the final curing cycle, per 701.73: Acceptance Sampling and Testing.

701.46: Protective Sealing

The Contractor shall apply sealing materials and procedures meeting 701.30.F: Protective Sealing Compounds only if one or more of the following final curing materials and procedures were applied:

- 701.30.E.1: Saturated Covers
- 701.30.E.2: Sheet Materials
- 701.30.E.3.a: Liquid Membrane-Forming Compounds for Curing

Protective sealing compounds shall not be applied to concrete surfaces applied with a final curing material and procedure meeting 701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing.

701.47: Cold Weather Concreting

The Contractor shall conduct cold weather concreting procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete, while surfaces are exposed to air temperatures falling below, or expected to fall below 40°F in accordance with 701.30.G: Cold Weather Concreting Materials. All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production.

701.48: Hot Weather Concreting

The Contractor shall conduct hot weather concreting procedures, operations, materials, and equipment required for the mixing, delivery, placement, finishing, curing, and protection of concrete, while surfaces are exposed to air temperatures exceeding, or expected to exceed 80°F; concrete temperatures approaching, or expected to approach 90°F; evaporation rates of surface water approaching, or expected to approach the bleeding rate of the concrete; high solar radiation; low relative humidity; and high wind speed in accordance with 701.30.H: Hot Weather Concreting Materials. All procedures, operations, materials, and equipment required for adequate protection and curing shall be present and ready for use prior to concrete production

CONTRACTOR QUALITY CONTROL

701.60: General

The Contractor shall provide adequate Quality Control (QC) to ensure that all materials and workmanship conform with the specification requirements. The Contractor shall perform QC activities as outlined further below.

701.61: Contractor Quality Control Plan

The Contractor shall provide and maintain a Quality Control Plan (QC Plan). The QC Plan should sufficiently document the QC processes of all Contractor parties (i.e. Prime Contractor, Subcontractors, Producers) performing work required under this specification.

701.62: Production Personnel

A. Foreman.

A foreman shall be present throughout the entire duration of the construction operation with at least one of the following personnel certifications.

- NRMCA Concrete Exterior Finisher Certification
- ACI Concrete Flatwork Technician and Flatwork Finisher

The foreman is responsible for the oversight of the construction operation per the requirements specified in Table 701.62-1.

Table 701.62-1: Minimum Foreman Activities

Operation	Foreman	Activity
Oversight	One (1)	Review and compare batch ticket quantities and sources to approved mix design
		Monitors conformance to AASHTO M 157 Standard Specification for Ready-Mixed Concrete
		Monitors conformance to Department specifications
		Monitors Production Personnel activities
		Verifies proper equipment is on hand prior to start of construction
		Monitors equipment, environmental conditions, materials, and workmanship
		Prohibits the use of prohibited equipment and practices
		Acknowledges sampling, testing, and inspection results

B. Operators.

Concrete sidewalk shall be constructed by sufficiently staffed, trained, experienced, and qualified equipment operators and craftsmen, who are presently involved in sidewalk construction, throughout the entire duration of the construction operation, per the requirements specified in Table 701.62-2.

Table 701.62-2: Minimum Operator Activities

Operation	Operators[1]	Activity
701.40: **Pre-Placement**	Two (2)	Apply sufficient base compaction
		Moisten sub-base, free of standing water
		Secure forms, straight and level
		Mark expansion locations
		Prohibited Practices: Placement on frozen sub-grade
701.41: **Placement (Concrete Discharging)**	Two (2)	Direct concrete trucks
		Handle chute discharge and truck movement
		Assist in preparing concrete for testing
		Direct trucks to washout area
		Provide general help
		Prohibited Practices: Adding constituent materials not in conformance with AASHTO M 157 or without Department consent
701.41: **Placement**	Two (2)	Localize placement to minimize moving material
		Level concrete in front of the screed
		Operate come-alongs or flat headed shovel to move concrete in form

		Consolidate concrete along form edge to avoid honeycombing
		Operate screed over top of forms in sawing action for surface leveling
		Operate magnesium bull float to push coarse aggregate below the surface and fill in the low spots or depressions
		Prohibited Practices: Toothed raking, dragging of internal vibrator, and internal vibrator to move concrete; steel troweling or floating
701.42: **Initial Curing**	Apply an initial curing material and procedure per 701.42	
	One (1)	701.30.C.1: Liquid-Applied Evaporation Reducers
701.43: **Finishing**	Two (2)	Permit bleed water to dissipate and concrete to set
		Operate a hose drag or squeegee to remove water from the surface
		Check surface for flatness, fill/cut as necessary
		Finish surface with magnesium float
		Apply pulled broom finish at proper time to acceptable texture
		Clean broom when excessive mortar adheres
		Remove excess water from broom before use
		Finish edges and joints
		Finish well formed, properly spaced joints to sufficient depth
		Prohibited Practices: Steel troweling or floating; adding water to the surface; excessive working of surface; pushing broom across surface

[1] Recommended number of operators.

Table 701.62-2: Minimum Operator Activities (Continued)

Operation	Operators[1]	Activity
701.44: **Intermediate Curing**	If applicable, apply an intermediate curing material and procedure per 701.44	
	One (1)	701.30.C.1: Liquid-Applied Evaporation Reducers
	One (1)	701.30.E.3.a: Liquid Membrane-Forming Compounds
	One (1)	701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing
701.45: **Final Curing**	Apply a final curing material and procedure meeting 701.45	
	Four (4)	701.30.E.1: Saturated Covers
	Four (4)	701.30.E.2: Sheet Materials
	One (1)	701.30.E.3.a: Liquid Membrane-Forming Compounds
	One (1)	701.30.E.3.b: Liquid Membrane-Forming Compounds for Curing and Sealing
701.46:	One (1)	If applicable, apply a protective sealing material and procedure per 701.46

Protective Sealing		
701.47: **Cold Weather Concreting**	Four (4)	If applicable, apply cold weather concreting materials and procedures per 701.47 and the Department approved Contractor cold weather concreting plan
701.48: **Hot Weather Concreting**	Four (4)	If applicable, apply hot weather concreting materials and procedures per 701.48 and the Department approved Contractor hot weather concreting plan

[1] Recommended number of operators.

701.63: Quality Control Inspection

Quality Control inspection shall be performed and reported on inspection report forms by qualified Quality Control Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship. Quality Control Technicians shall obtain at least one of the following personnel certifications.

- NRMCA Concrete Exterior Finisher Certification
- ACI Concrete Flatwork Technician and Flatwork Finisher

Quality Control inspection report forms shall be completed by the Contractor and submitted to the Department for review.

DEPARTMENT ACCEPTANCE

701.70: General

Acceptance shall be performed by the Department, including consultants under direct contract with the Department independent of the Contractor, to evaluate the degree of compliance with contract requirements, to monitor each Contractor entity's Quality Control activities, to determine the corresponding value for a given product, and to determine the acceptability of all material produced and placed.

701.71: Acceptance of Contractor Quality Control Plan

The Department will review the Contractor Quality Control Plan. Department approval shall be subject to conformance with the requirements specified herein.

701.72: Acceptance Inspection

Acceptance inspection will be performed and reported by qualified Department (or designee) Acceptance Technicians, to confirm conformance to specifications and to visually inspect equipment, environmental conditions, materials, and workmanship.

701.73: Acceptance Sampling and Testing

Acceptance sampling and testing will be performed and reported by qualified Department (or designee) Acceptance Technicians, to provide quality characteristic data used for Department Acceptance determination, per the requirements specified herein.

Table 701.73-1: Minimum Acceptance Sampling and Testing Requirements

Property	Method	Quality Characteristic	Sublot Size	Minimum Test Frequency	Point of Sampling	Criteria
Uniformity	T 119	Slump Allowable Tolerance (in.)[1]	100 cy	1 per Sublot	Point of Discharge	Target ± 1.5
Workability	T 119	Segregation Resistance[2]	100 cy	1 per Sublot	Point of Discharge	Pass
Thermal	T 309	Concrete Temperature (°F)	100 cy	1 per Sublot	Point of Discharge	50 – 90
Strength	T 22	Compressive Strength at 7 Days for Curing Termination (psi)[3]	100 cy	1 per Sublot	Point of Discharge	≥ 70% f'_c
		Compressive Strength at 28 Days (psi)[3]	100 cy	1 per Sublot	Point of Discharge	≥ 100% f'_c
		Compressive Strength at 56 Days (psi)[3][4]	100 cy	1 per Sublot	Point of Discharge	≥ 100% f'_c
Durability	T 121 T 152 T 196	Freezing and Thawing Resistance: Air Content (%)	100 cy	1 per Sublot	Point of Discharge	5.5 – 8.5
	T 303 or C1567	Alkali Silica Reaction Resistance: Expansion at 14 Days (%)	–	1 per Annual Mix Design Submission Cycle	–	≤ 0.08

[1] Test result and the Producer’s mix design target shall be within the specified allowable tolerances. Slump shall be reported on the Producer’s mix design batch ticket for each delivery.

[2] Testing for segregation resistance shall be performed while the concrete is being discharged and during AASHTO T 119 Standard Method of Test for Slump of Hydraulic Cement Concrete. Visual signs of segregation include coarse particles advancing in front of or behind the fine particles and mortar and a tendency for coarse aggregate to separate from the mortar, particularly when the mixture is being consolidated.

[3] Three (3) 4 x 8 in. compressive strength cylinders shall be cast and tested for each age per sublot.

[4] Testing only required if compressive strength results at 28 days do not conform with specifications.

COMPENSATION

701.80: Method of Measurement

Cement Concrete Sidewalks, Pedestrian Curb Ramps, and Driveways will be measured in square yards including fine grading and compacting.

Excavation will be measured by the cubic yard as specified in 120.80: Method of Measurement.

Gravel Borrow will be measured by the cubic yard as specified in 150.80: Method of Measurement.

701.81: Basis of Payment

Cement Concrete Sidewalk, Cement Concrete Pedestrian Curb Ramp (Wheelchair Ramp), and Cement Concrete Driveway will be paid for at the contract unit price per square yard complete in place, including detectable warning panels and all incidental materials, labor, and equipment necessary to complete the work to the satisfaction of the Engineer.

Gravel will be paid for at the contract unit price per cubic yard under Item 151: Gravel Borrow.

Fine grading and compacting will be considered incidental to these items.

Excavation will be paid for at the contract unit price per cubic yard under the excavation items.

701.82: Payment Items

701.	Cement Concrete Sidewalk	Square Yard
701.1	Cement Concrete Sidewalk Driveways	Square Yard
701.2	Cement Concrete Pedestrian Curb Ramp	Square Yard

SECTION 701
SIDEWALKS, WHEELCHAIR RAMPS AND DRIVEWAYS

DESCRIPTION

SUBSECTION 701.20 GENERAL

Add the following at the end of this subsection:

Minimum clear path of travel for all walkways shall be no less than 52" per Town of Lexington Standards and as shown on the construction details.

MATERIALS

SUBSECTION 701.40 GENERAL

Add the following at the end of this subsection:

Fiber Mesh shall meet the following requirements;

Fiber mesh fibers (100% virgin polypropylene, collated, fibrillated fibers) at a rate of 1.0 - 1.5 lb. per cubic yard of concrete shall be added for reinforcement. Fiber mesh shall be FIBERMESH 150, manufactured by PROPEX Concrete Systems or an approved equal. Installation shall be per manufacturer's recommendations.

CONSTRUCTION METHODS

SUBSECTION 701.61 B. PLACING AND FINISHING CEMENT CONCRETE

Replace the second sentence of paragraph four with the following:

At driveways and wheelchair ramps, the sidewalks shall be 6 inches (200 mm) deep.

Add the following at the end of paragraph three:

Detectable warning panels shall be brick red unless otherwise indicate in the standard details.

Add the following to the end of this subsection:

All concrete shall be fiber reinforced.

Placement of cement concrete shall be completed no later than 2 P.M. on each day of operation to ensure proper set-up time before the end of the work day.

The Town of Lexington Engineering Division does not allow pouring of cement concrete sidewalks between November 1 and March 31. All sections prone to pedestrian and/or vehicular movement shall be protected, as necessary, until proper curing has occurred. All vandalized sections shall be replaced at contractor's expense.

SUBSECTION 701.62 HOT MIX ASPHALT SIDEWALKS AND DRIVEWAYS

Add the following to subsection 701.62 after paragraph 2:

The hot mix asphalt pavement shall be laid in courses with the top course 1 ½ inches after rolling and previous courses no greater than 2 inches after rolling and shall match the total thickness of the existing asphalt or as directed by the engineer. Prior to excavating for the sidewalk or driveway the area shall be sawcut the full depth of existing asphalt.

COMPENSATION

SUBSECTION 701.80 METHOD OF MEASUREMENT

Add the following to the end of this section:

Sawcutting shall be incidental to the items for sidewalks and roadway patches

Fiber reinforcement shall be incidental to all cement concrete items.

SUBSECTION 701.81 BASIS OF PAYMENT

Add the following to the end of this section:

Price adjustments for hot mix asphalt (all asphalt items under section 701) will be made in accordance with Document 00811 published by MassDOT revised July 8, 2016. Asphalt adjustment shall be documented on each invoice with no adjustment shown on invoice one. Invoice two will include the adjusted asphalt cost from the invoice one tonnage and so on. The contractor shall provide documentation and calculations demonstrating the proper adjustment. The base bid for liquid asphalt on this contract shall be the period price at the date of the bid opening as published by MassDOT on its website.

Fiber reinforcement shall be incidental to all cement concrete items.

Sawcutting shall be incidental to the items for sidewalks and roadway patches.

Insert the following new subsection in numerical order:

SECTION 706
MISCELLANEOUS WALK TREATMENT

DESCRIPTION

SUBSECTION 706.20 GENERAL

The work under this item shall conform to the relevant provisions of Section 700 of the Standard Specifications and the following:

The work consists of reusing existing or supplying and installing new various sidewalk treatments as shown on the plans or required by the Engineer. Work includes new/used pavers to provide transitions from walkways and driveways to new cement concrete walk, removing and relaying of existing brick or field stone walks similar to the existing conditions and in close conformity with existing lines and grades.

Samples, Submittals and Field Mock-Up

The Contractor shall reuse the existing bricks, pavers, field stone or other materials or provide new similar materials as required and specified in the standard specifications, these special provisions or as indicated on the Drawings. The Contractor shall provide material descriptions, certified test results and manufacturer's product information for any new materials as required by the Engineer.

The Contractor shall submit at representative sample to the Engineer to indicate each shape, size and color to be supplied. The Contractor shall submit the manufacturers' product data for Polymeric Sand.

Quality Assurance

Maintain quality control of all batching, coloring, and forming of all units, supplemental unit parts, and in the delivery of said units.

All manufacturers shall have a minimum of five (5) years in producing brick pavers.

All pavers shall conform to standards defined by ASTM: American Society for Testing and Materials with relation to requirements of materials and their performance standards.

Units shall be free of cracks, chips, scratches and any other defect at the time of delivery. All units shall be placed in a storage area, protected from damage prior to and during transit to the Owner's or Contractor's site.

Edging Material shall meet minimum requirements based on the Stork Method.

MATERIALS

SUBSECTION 706.40 GENERAL

Brick Walk Pavers
Brick pavers will match in size, color and quality to the existing brick pavers used in each respective walkway. New pavers will have a thickness of 2 inches and be set as shown on the plans or as required by the Engineer.

Brick Driveway Pavers

Brick driveway pavers will match in size, color and quality of the existing brick pavers used in each respective driveway. New pavers will comply with ASTM c1272-11 type R & F Specifications for Heavy Vehicular Paving Brick 2-3/4" thickness and shall be set as shown on the plans or as required by the Engineer.

CONSTRUCTION METHODS

SUBSECTION 706.60 GENERAL

Delivery, Handling and Storage

Deliver pavers to the site in steel banded, plastic banded, or plastic wrapped cubes capable of transfer by forklift or clamp lift, with manufacturer's name and product brand. Store all materials in dry locations, protected from weather, stored off the ground, and secured on-site.

Polymeric sand shall be covered with a waterproof covering to prevent exposure to rainfall or removal by wind. The covering shall be secured in place.

Installation

The Joint Sand, also called polymeric sand and bedding sand shall be furnished and placed under requirements of Section 706, of the Standard Specifications, as shown on the plans or required by the Engineer.

Dense graded crushed stone shall be furnished and placed under the requirements of Section 402, of the Standard Specifications, as shown on the plans or as required by the Engineer.

The setting bed for the walkway pavers shall be masonry sand over a base of dense graded crushed stone over gravel borrow. Spread the sand setting bed evenly over the base and screed to thickness noted on the Drawings.

The setting bed for the driveway pavers shall be neoprene modified asphalt adhesive over a base of cement concrete, air entrained, 4000 psi, ¾ inch, 610 lbs/cu.yd. over gravel borrow.

Gravel borrow base shall be furnished and placed under requirements of Section 151, gravel base course of the Standard Specifications, and the sections and elevations shown on the Drawings.

Lay the pavers in the pattern(s) to match the existing walkway and/or driveway or as required by the Engineer. Maintain straight and uniform pattern lines.

New paver areas shall be hand placed paving units set with maximum 1/8 inch joints. Mechanically vibrate pavers to uniform and true level to finish grade.

Reset or new pavers used to rebuild existing walkways and/or driveways shall be set with joint width matching existing joint width of walkway and/or driveway being retained.

Polymeric sand shall only be added to joints when pavers are completely dry. All sand shall be swept from paver surface before the joint sand is watered in to avoid sand cementing to the paver surface. After initial joint sand application is watered in and pavers are completely dry, a second application of sand shall be swept into the joints to fill any remaining voids. After all sand has been removed from the paver surface the joints shall be watered thoroughly. This process shall be repeated until all joints are filled. Clean all paver surfaces as needed until the polymeric sand is completely removed from the brick surface.

Pavers shall have a deviation of 3/8” or less over a 10’ length measured with a metal straight edge.

Cut pavers shall be no less than half a brick. Pavers shall be cut with a masonry saw and have a clean edge. Pavers that get chipped or do not have a clean edge will either be recut or replaced with a new paver.

The complete paver surface shall be swept clean and washed down with water to provide a finished installation according to manufacturers’ recommendations. Any stains that occur during construction shall be removed prior to acceptance at no cost to the Owner.

Any damaged paving units found prior to project acceptance shall be removed. The paver replacement units shall match in color with adjacent units, at no additional cost to the Owner.

If installing edging before bedding sand and pavers:
Place edging on compacted base. Edging shall not be installed on top of the bedding layer. Spike rigid style edging using predrilled holes, with a maximum spacing of 24" between spikes. Spike placement may be placed through the back if needed. Installing flexible style edging with a maximum spacing between spikes of 12". Connect additional sections of edging as needed.

If installing edging after bedding sand & pavers:
Use a trowel or flat head shovel to cut down along the back of the paver, and pull away the excess bedding sand without disturbing the base material. Connect sections together. Place edging directly on the compacted base material. Slide the retention lip under the bedding layer. Edging shall not be installed on top of the bedding layer. Spike into place following the same spike placement specifications as noted above. Nail the spike at an angle with the point driven inward toward the pavement (toe-nailing) to keep edging tight to the pavement.

COMPENSATION

SUBSECTION 706.80 METHOD OF MEASUREMENT

Miscellaneous Walk Treatment will be measured for payment by the square yard, complete in place.

SUBSECTION 706.81 BASIS OF PAYMENT

Miscellaneous Walk Treatment will be paid at the Contract unit price per square yard, which price shall include all labor, materials, equipment and incidental costs required to complete the work.

No separate payment will be made for excavation, gravel borrow, fine grading and compacting, geotechnical fabric, dense graded crushed stone, setting bed sand, concrete, and polymeric joint sand, but all costs in connection therewith shall be included in the unit bid price for Item 706.7 Miscellaneous Walk Treatment.

Where new brick walk, existing brick walk or field stone is removed and reset over an area where there is no sidewalk or driveway currently, reclaimed base may be used or, if none is available, gravel borrow will be provided and paid for under item 151 Gravel Borrow.

SUBSECTION 706.82 PAYMENT ITEMS

ITEM 706.7	Miscellaneous walk treatment	Square Yard

SECTION 751
LOAM BORROW, PLANTABLE SOIL BORROW, PROCESSED PLANTING MATERIAL OR TOPSOIL REHANDLED AND SPREAD

CONSTRUCTION METHODS

SUBSECTION 751.63 PLANTABLE SOIL BORROW
Add the following at the end of this subsection:

Plantable Soil Borrow shall be placed at a compacted depth of no less than 4 inches.

COMPENSATION

SUBSECTION 751.80 METHOD OF MEASUREMENT
Replace the first sentence of this subsection with the following:

The quantity of Plantable Soil Borrow shall be measured in place after compaction to the limits specified on the plans, or as directed by the Engineer. When quantities of Plantable Soil Borrow are given in tons, a factor of 1.40 tons per cubic yard will be used to convert the measurement to cubic yards.

SECTION 850
TRAFFIC/SAFETY CONTROLS FOR CONSTRUCTION AND MAINTENANCE OPERATIONS

DESCRIPTION

SUBSECTION 850.20 GENERAL
Add the following at the end of this subsection:

Work of this section shall also include Traffic Police Details and Fire Details as required for protection of the traveling public and working personnel during construction operations.

SUBSECTION 850.21 SAFETY CONTROLS FOR CONSTRUCTION OPERATIONS
Replace this subsection with the following:

Safety controls for construction operations consists of furnishing, positioning, repositioning, maintaining, and removing as needed and/or as directed: reflectorized drums, traffic cones, high level warning devices, delineators, floodlights, Type I and II barricades, portable flashing and steady burning lights, hand signal devices, lanterns and pilot cars.

SUBSECTION 850.22 SAFETY SIGNING FOR CONSTRUCTION OPERATIONS
Add the following at the end of this subsection:

Safety Signage for Construction Operations shall include the following signs, mounted permanently on their own posts throughout the duration of the project, at locations to be determined by the Engineer:

QUANTITY	*DESIGNATION*	*SIZE*	*SIGN WORDING*
8	MA-R2-10a	48” X 36”	WORK ZONE SPEED FINES
10	MA-R2-10e	36” X 48”	END ROAD WORK
5	W20-1	36” X 36”	ROAD WORK AHEAD
3	W20-1B	36” X 36”	ROAD WORK AHEAD 1500FT

Safety Signage for Construction Operations may also include, but is not limited to, the following signs, mounted temporarily on their own posts or stands, as directed by the Engineer:

QUANTITY	*DESIGNATION*	*SIZE*	*SIGN WORDING*
2	R3-7L	30” X 30”	LEFT LANE MUST TURN LEFT
2	R3-7R	30” X 30”	RIGHT LANE MUS TURN RIGHT
1	R4-7	24” X 30”	KEEP RIGHT
2	R9-9	30” X 18”	SIDEWALK CLOSED
2	R9-11a	48” X 24”	SIDEWALK CLOSED CROSS HERE
2	W4-2L	36” X 36”	LEFT LANE ENDS MERGE
1	W4-7R	36” X 36”	RIGHT LANE ENDS MERGE
1	W4-7L	36” X 36”	THRU TRAFFIC MERGE LEFT
2	W5-1	36” X 36”	ROAD NARROWS
2	W8-1	36” X 36”	BUMP
2	W8-3	36” X 36”	PAVEMENT ENDS
2	W8-15	36” X 36”	GROOVED PAVEMENT
2	W8-24	36” X 36”	STEEL PLATE AHEAD
4	W11-2	30” X 30”	PEDESTRIAN
4	W13-1p	24” X 30”	ADVISORY SPEED
4	W16-7pL	24” X 12”	DOWNWARD DIAGONAL ARROW
2	W20-4	36” X 36”	ONE LANE ROAD
4	W20-4C	36” X 36”	ONE LANE ROAD 1000FT
2	W20-5L	36” X 36”	LEFT LANE CLOSED XXX
2	W20-7	36” X 36”	FLAGGER
4	MA-W20-7b	36” X 36”	POLICE OFFICER AHEAD
2	W21-5aR	36” X 36”	RIGHT SHOULDER CLOSED

The Contractor shall furnish, erect, remove, cover, relocate, and replace if necessary, all signs as directed by the Engineer. All signs shall be removed when no longer required and all signs listed above shall become the property of the Town of Lexington at the completion of the contract.

Add this new subsection:

SUBSECTION 850.38 TRAFFIC POLICE DETAILS AND FIRE DETAILS

This work consists of scheduling Traffic Police Details when construction operations involve work which is of a nature where the use of a Traffic Police Detail would be required to increase safety of the general public and construction personnel.

This work also consists of scheduling Fire Details when construction operations involve blasting work. A Fire Detail will be required at all times explosives are present on site.

Scheduling of Details shall be made through the Contractor.

The Contractor is responsible for canceling Details directly in the event of schedule changes where work no longer requires the use of Details, or cancellations of work for any reason, including weather.

MATERIALS

SUBSECTION 850.40 GENERAL

Add emphasis in paragraph one sentence one to the wording ***"must be in first class condition and acceptable to the engineer".***

All safety signage under this contractor shall be mounted on plywood as described in this subsection.

SUBSECTION 850.43 SAFETY SIGNING FOR TRAFFIC MANAGEMENT

Add the following at the end of this subsection:

All safety signage under this contractor shall be mounted on plywood as described in this subsection.

COMPENSATION

SUBSECTION 850.80 METHOD OF MEASUREMENT

Add the following at the end of this subsection:

Traffic Police Details and Fire Details shall be paid actual man-hours, for which such services are rendered as required, as billed according to the Detail's union contract in effect at the time of work.

The Contractor shall be responsible for all payments of Traffic Police Details and Fire Details incurred when the Contractor is unable to cancel Details with a minimum of one hour notice, in the event of schedule changes where work no longer requires the use of Details, or cancellations of work for any reason, including weather. Such man-hours shall be billed directly to the Contractor, according to the Detail's union contract in effect at time of work, and shall be kept separate from man-hours to be reimbursed by the Owner, and in no case will such payments be reimbursed.

The allowance established in the Bid Form is for bidding purposes only. The actual invoiced rates and quantities may differ from these established rates.

SUBSECTION 850.81 BASIS OF PAYMENT

Add the following at the end of this subsection:

Payment for Traffic Police Detail and Fire Detail shall be paid man-hours for services rendered as required, as measured in Subsection 850.80. Such man-hours shall be paid directly by the Contractor and reimbursed by the Town of Lexington for the amount billed and paid.. Payment will not be made for man-hours the Contractor shall be responsible for, as stated in Subsection 850.80, METHOD OF MEASUREMENT. Evidence of payment of details by the contractor shall be provided to the town monthly to ensure payments are being made. Lack of payment or evidence may result in delays in processing invoices to the contractor or a work stoppage order to the contractor.

SUBSECTION 850.82 PAYMENT ITEMS

Add the following at the end of this subsection:

ITEM 999.	Traffic Police Detail	Man-Hours
ITEM 999.5	Fire Detail	Man-Hours

END OF SUPPLIMENTAL SPECIFICATION (TOWN OF LEXINGTON)

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SECTION 02500
SPECIAL PROVISIONS

SCOPE OF WORK

The Work consists of, but is not limited to, the roadway and streetscape improvements along Massachusetts Avenue (Route 4 & 225) between Meriam Street and Cary Hall Entrance (Sta. 29 +25), and work along Waltham Street to Vine Brook Road and sidewalk improvements at Cary Hall. The work will consist of areas of full depth pavement reconstruction, milling and overly, brick sidewalks and cement concrete sidewalks with brick accent bands, planter seat benches, street furnishings, bike racks, wheelchair ramps, removing and resetting of curb, installation of new granite curb, drainage improvements, miscellaneous water work, installation of new ornamental light system with load centers and service connections, loaming and seeding, inground irrigation system, plantings and various streetscape amenities, signal equipment upgrade at Waltham Street intersection, automated parking pay stations, signing and pavement markings and other various items to complete the roadway and streetscape improvements in the Town of Lexington, and all incidental work necessary to complete the work as shown on the plans or described herein.

All work under this Contract shall be done in conformance with the Massachusetts Department of Transportation 2020 *Standard Specifications for Highways and Bridges*, all *Supplemental Specifications including Division I and II of Town of Lexington*; the *2017 Construction Standard Details*, the *1990 Standard Drawings for Signs and Supports*; the latest version of the *Manual on Uniform Traffic Control Devices (MUTCD)* with *Massachusetts Amendments* and the *Standard Municipal Traffic Code*; the *1968 Standard Drawings for Traffic Signals and Highway Lighting*; the latest edition of *American Standard for Nursery Stock*; the Plans and these Special Provisions.

References within the Standard Specifications to MassDOT, the Department, or the Engineer shall, for the purposes of this Contract, be construed to mean the Town of Lexington or its designated representative.

ARCHITECTURAL ACCESS BOARD TOLERANCES

The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations, and standards.

All construction elements in this project associated with sidewalks, walkways, wheelchair ramps and curb cuts are controlled by 521CMR - Rules and Regulations of the Architectural Access Board (AAB). The AAB Rules and Regulations specify maximum slopes and minimum, dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope or for dimensions less than the minimum dimensions.

Contractors shall establish grade elevations at all wheelchair ramp locations, and shall set transition lengths according to the appropriate table in the Construction Standards (or to the details shown on the plans).

ORDERING OF MATERIALS AND DRAWINGS

The Contractor shall provide the Engineer within thirty (30) days of receipt of the contract, written evidence that:

1. He has ordered the shop drawings for the materials for which shop drawings are required for this contract;

2. He has ordered from a supplier or manufacturer, the catch basin frames, grates and other such castings and materials necessary to complete the project.

The Contractor shall further provide the Engineer written evidence within thirty (30) days of receipt of the Contract that these orders have been confirmed in writing by the manufacturer with delivery dates appropriate for timely completion of the project. These confirmations of orders will become part of the project records.

Failure to comply with any of the ordering requirements shall nullify a request for an extension of the project completion date.

SHOP DRAWING SUBMITTAL (Supplementing Subsection 5.02)
The following is a list of special items and materials that require shop drawing or catalog cut approval in addition to standard items that required based on the specifications.

Street Lighting

Luminaires, including lamps, ballast
Lamp Sockets and Lamp holders
Independent Testing Laboratory Photometric Data
Lighting Standards, Poles & Brackets
Handholes
Other Lighting/Electrical related Items

Streetscape /Landscape

Aeration System
Irrigation system
Granite Curb for Planters
Modular Soil Cells
Granite Block
Wood Seat at Bench Planter, Wood Benches and Chair
Carousel Table and Seats
Cell Phone Charging Station with Accent Light
Traffic Signal Equipment
Bike Racks
Trash Receptacles
Big Belly trash and Recycling Units
Wood Planter
Tree Grates
Tree, Shrub, Perennials, Ornamental Grasses (Nursery visit)

Other

National Pollutant Discharge Elimination System (NPDES)
Storm Water Pollution Prevention Plan (SWPPP)
Construction Sequence & Traffic Management Plan
Soil Testing Results for all Soils and Soil Mixes
Arborist qualifications

MATERIALS REMOVED AND STACKED (Supplementing Subsections 580.64, 630.63)
Materials directed to be removed and stacked which are Town of Lexington property, shall be removed, transported to and stacked at the **Town /Department Public Works (DPW) Yard on 201 Bedford Street with the exception of the Woodshed which will be relocated to a designated location to be determined by the Town** All materials shall be neatly stacked as directed by the Town. In addition, all materials stacked shall be signed off by DPW. When directed by the Engineer to remove and stack materials which are privately owned, said materials shall be removed, transported to, and stacked on the property, from which the materials have been removed.

If the Town of Lexington determines that any part of the stacked materials are unsuitable for re-use by the Town, or if other owners decide to abandon part or all of their materials, such materials shall become the property of the Contractor and he shall properly dispose of them away from the site.

The prices for the various items of this contract shall include full compensation for the work noted above.

CONCRETE FOUNDATIONS
Concrete foundations of items to be removed, if not interfering with the proposed construction, may be abandoned in place with approval of the Engineer. Foundations left in place under roadway surface shall be removed to a depth of 3 feet below finished grade; all other foundations left in place shall be removed to a depth of 12 inches below the finished grade. The top 12 inches shall be restored to match the existing grade with materials similar in kind to the abutting materials.

PERMITS AND LICENSES
Before any electrical connections are made the Contractor shall submit copies of the current licenses of all electricians who will perform the electrical work. Within ten (10) days after opening of bids, the low bidder shall submit a list of the Journeyman Electricians (MA license) who will perform the electrical work in this contract, along with copies of each Journeyman Electrician's current Massachusetts license. The Contractor shall be responsible for obtaining all necessary permits and licensing from the Town and other agencies, as required.

The Contractor shall provide to the Engineer and to the police and fire departments a contact list of contractor personnel who can be notified in the event of an emergency. The list shall have the names and telephone numbers of personnel available 24 hours a day, 7 days a week for the duration of the field work. The list shall be kept current, and shall include secondary contacts as needed to ensure that an authorized person is available at all times to mobilize crews as required to respond to emergencies. If contacted directly by emergency response personnel, the Contractor shall immediately notify the Engineer.

The Contractor will cooperate fully with all utility companies private or public, and will notify all such companies at least twenty-four hours prior to excavating in the vicinity of any utility. It is understood that the Contractor has considered in his bid the existence of the various utilities and that no additional compensation will be allowed for any delays, inconvenience, or damage sustained by him due to any interference by said utilities.

DRAINAGE SYSTEM (Supplementing Section 201 and following)
It shall be the Contractor's responsibility to maintain a proper drainage system at all times in the areas under construction. Existing drainage shall not be taken out of service without prior written notice to the Town. All pipes and structures installed as part of this Contract shall be left in a clean and operable condition at the completion of the work. Drainage pipes and structures requiring cleaning as a result of accumulations

from construction operations shall be cleaned of debris within one (1) week after surface course pavement has been completed.

Drainage castings in new pavement areas shall be installed at base or binder course grade, as directed by the Engineer, and reset to proposed finish surface grade prior to placement of the pavement surface course. All existing pipes to be abandoned shall be plugged with brick masonry not less than 8” in thickness in conformance with the MassDOT Standard Specifications, Section 201.62.

No separate payment will be made for sawcutting required for installation of drainage pipe trenches and structures. All such costs shall be taken as included in the unit prices bid for the various pipe items.

No separate payment will be made for the maintenance of the existing drainage system, for plugging of pipes, or for cleaning and disposal of material from impacted drainage structures and pipes (unless otherwise provided for under this contract), but all costs in connection therewith shall be included in the unit prices bid for the various Contract items.

DRAINAGE STRUCTURES (Supplementing Section 220 and following)

Where new pipe is shown on the drawings to be connected into an existing drainage structure to remain, the existing structure shall be first cleaned to remove all mud, debris and other material. The existing structure wall shall be carefully and neatly cut to provide the minimum size opening required for the insertion of the new pipe. The proposed pipe end shall be set or cut off flush with the inside face of the existing structure wall and the remaining space around the pipe completely filled with cement grout for the full thickness of the structure wall.

Existing shaped inverts shall be reconstructed, as necessary to provide a smooth and uniform flow channel from the new pipe through the existing structure.

No separate payment will be made for the cost of connecting new pipes into existing structures, cleaning and proper disposal of material and necessary alterations of existing structures, but all such costs shall be taken as included in the unit prices bid for the various pipe items. In addition no separate cost will be made for existing frame and grate (or cover) to be removed and stacked, but shall be made incidental to the appropriate drainage structure items, whether it be adjusted, change in type, remodeled, abandoned, or proposed.

ENVIRONMENTAL CONTROLS

All construction equipment shall be fitted with suitable muffling devices so that the noise from construction operation shall be properly controlled. The Contractor shall control all dirt, dust erosion and other related construction emissions from the project to the satisfaction of the Engineer.

CONCURRENT WORK BY OTHERS WITHIN PROJECT LIMITS

Concurrent work may be in progress in the project area by others, including but not limited to, the Town and various utility companies. The Contractor is required to coordinate his activities with all work by others within and adjacent to the project limits.

The Contractor's attention is brought to the fact that Eversource/NGRID will be performing some concurrent gas relocation work to remove conflicts with drainage structures. The Contractor shall coordinate with Eversource/NGRID on the scheduling of this work.

Additionally, the Town is anticipating the moving of 'The Hosmer House' which is located immediately easterly of the Police Station. House will be moved to Harrington Road and is expected to travel directly down Massachusetts Avenue. The move is anticipated to last one day along with some advance site prep work such as the removal of signal arms. The contractor shall cooperate with the schedule of the house move which may entail shut down of construction for up to three days. This work is anticipated to be in the spring or summer of 2021.

No additional payments will be allowed for any disruption of work schedule caused by or required to coordinate work in this contract and work to be performed by others.

LAYDOWN AREA

The Town will provide a laydown area to the Contractor for his use on this project. The Contractor must discuss this with the Town before beginning to use the designated laydown area. It is a small parcel called Fletcher Park a.k.a. the Farmers Market, at the corner of Mass. Ave. and Fletcher Ave. This area will have strict requirements for use including,

- Tree protection for all trees
- Construction fence around entire site and around the dripline of all trees and also 5 feet off of all shrubs
- Erosion control around entire site as well using silt bags in catch basins (with overflow) and a mulch filled compost filter sock
- Area is to be kept clean and neat and a construction entrance built with stone to ensure no tracking
- Any tracking swept daily. The area does not include any of the parking lot or the Hosmer house property, it is strictly the Famers market land and no other land will be provided by the town for staging. Contractor is responsible for finding any other necessary staging areas
- Contractor shall restore the laydown area to original conditions as satisfaction to Town upon completion of the project. Any disturbance area shall be replaced in kind.
- The Town WILL NOT BE responsible for security of materials.

WORK SCHEDULE (Supplementing Section 8.00)

All work shall be restricted to 7:00 AM to 4:00 PM, five-day week with the Prime Contractor and all Subcontractors working on the same shift. No work, including the setting up and taking down of work area traffic control devices shall be done within existing roadways between the hours of 7:00-7:30 AM and after 3:30 PM, unless otherwise approved by the Town. Work shall be permitted in areas outside and off the roadway during these periods. No Hot mix asphalt will be placed after November 15. No work shall be done on this contract on Saturdays, Sundays, Nights or Holidays without prior approval by the Town.

The businesses within and near the project limits and project area itself attract a significant number of tourists and patrons. The contractor shall collaborate with the Town on any lane closures and notify the Town within 10 working days to avoid special events. The Contractor shall be required to clean the site and secure all equipment and materials prior to the events. This shall include making sure that all pedestrian sidewalks and temporary pedestrian provisions are accessible to all users. If equipment and materials cannot be safely secured, they shall be removed from the work site. This cleaning, securing, and inspecting the work area each week shall be considered incidental to work items performed.

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Before starting any work on this contract, the Contractor shall submit a schedule of operations 10 days ahead to ensure proper notification of businesses.

TRAFFIC MANAGEMENT (Supplementing Section 8.00)

The Contractor shall follow the requirements for Traffic Management unless otherwise directed by the Town. Traffic Management Typical Details are included as part of the contract documents.

The Contractor shall prepare and submit to the Town a proposed work schedule which complies with the plans and specifications. No work shall begin until the Town's approval of the schedule. A traffic control plan must be submitted a minimum of 10 days before construction starts in any given area.

All work, including the setting up and taking down of work area traffic control devices shall be done between the hours of 7:00 AM and 4:00 PM. If significant traffic delays are experienced during working hours, the Contractor may be required to stop work. No work shall be done on this contract on Saturdays, Sundays, holidays, nights or the day after a long weekend, without prior written approval from the Engineer.

It is the intent of these Special Provisions to minimize the construction impacts to the traveling public and abutting property owners by limiting the extent of roadway and sidewalk construction. The Engineer reserves the right to require the Contractor to alter the lengths of excavation and other operations.

In general, the Contractor’s prosecution of the work shall comply with the following minimum requirements:

- Roadways must remain accessible throughout the construction for emergency apparatus, tour buses, tourist activity, business, and residents at all times unless previously approved by the Town.
- Existing travel lanes of traffic in each direction of travel must be maintained on all streets at all times, except where otherwise approved by the Town in advance.
- The traffic signal control and operations at Mass Ave and Waltham Street needs to be maintained throughout the project. The contractor shall notify the Town/Engineer within 72-hour of any traffic signal operation interruptions and shall be approved by the Town/Engineer. The contractor needs to maintain existing timing plans and detection until proposed timing and detection is implemented, and that timing modifications and temporary detection as needed are incidental to the lump sum traffic signal Item 816.01.
- Sidewalk shall remain open on both side of the roadway at all times, except where otherwise approved by the Town in advance.
- Contractor shall be required to phase sidewalk reconstruction to minimize pedestrian inconvenience and access to businesses.
- Work at intersections shall be undertaken so as to maintain all existing turning movements.
- Pedestrian and vehicular access to all abutting properties shall be maintained except for very short periods of time. When it is necessary to deny access to a property, the owner shall be informed at least 10 days in advance.
- The project involves the installation of a new ornamental street lighting system and the removal of certain lights, as outlined in the plans and in these specifications. The Contractor shall be required to sequence these operations so as not render the project area “dark”.
- The Contractor shall be required to cooperate with the Town on minimizing impacts to various Town events.

CONSTRUCTION WORK AREAS & SEQUENCING (Supplementing Section 8.00)

As stated above, the Project is to be constructed in such a manner as to minimize overall disruption to the businesses and other activities that take place along Massachusetts Avenue (Route 4 & 225). This shall be taken to mean the efficient management of day to day operations, as well as expeditious prosecution of the project and limit its duration to the extent possible. This section provides additional parameters for the Contractor to include in the scheduling of construction operations.

The Town is open to alternatives that the Contractor may have to expedite the work and minimize the disruption. The Contractor can offer alternatives or modifications for discussion and consideration by the Town, as long as the guiding principles and parameters of this section and the contract documents are met.

There are Work Areas indicated on the Plans for each location of construction. These Work Areas are not required to be completed in numerical order, however the work required in each Work Area must be completed before the Contractor can begin work in another Work Area.

The provisions, which follow, highlight the requirements of the different portions of work:

Prior to beginning the work, the Contractor shall place the required temporary control devices and warnings signs. The Contractor shall also submit to the Engineer a Schedule of Work that details the sequence of work and the order in which each Work Area will be completed. This schedule will be submitted every two weeks and any changes will be approved by the Town before the Contractor begins work.

The Contractor shall limit sidewalk reconstruction operations, excluding brick work, to 300 feet at a time or one block as approved by the Town. The Town will consider the Contractor's proposals to reconstruct more than one non-contiguous sidewalk section at a time.

The Contractor shall always provide access to abutting properties using temporary handicapped accissible ramps, as well as allow for safe pedestrian passage through or around each work Area.

The Contractor shall maintain the existing street lighting until the new street lighting system is installed and operational. The contractor shall also be required to place full size panels in the sidewalk area to match the pattern of the new previously poured concrete sidewalk after the existing light poles, bases and foundations have been removed. Until the existing streetlights are replaced and the new sidewalk is replaced the Contractor shall utilize Item 472 to provide a temporary walking surface in the area of the existing light poles.

The following general construction stages are recommended. The Contractor is free to make a proposal for alternative sequencing for the Town's consideration, however the proposed sequencing shall meet the overall construction management requirements in these documents.

- Construct all proposed drainage and utilities (lighting, etc.), conduits, and adjust, abandon, remove, or remove and rest, all existing utilities, as shown on the plans.
- Install irrigation, silva cells, and structural soil.
- Remove and reset or replace curb as shown on the plans, and construct sidewalks.
- Excavate roadway and place gravel subbase while maintain traffic in each direction on the existing roadway. Place crushed stone and base course.
- Install traffic signal equipment and signing.
- Install remaining streetscape features.
- Variable depth pavement milling as shown on the plans and sections.
- Place binder course followed by top course for the entire length of the project.
- Install pavement markings.

SAFETY CONTROLS FOR CONSTRUCTION OPERATIONS (Supplementing Subsection 850.21 and 850.61 and following)
Safety controls for construction operations shall be provided in accordance with the relevant provisions of Section 850 of the Standard Specifications, the Manual on Uniform Traffic Control Devices (MUTCD), the Traffic Management Plan, and the following:

Unless otherwise provided for by specific items of this contract, the provision of safety controls for construction operations shall be considered incidental to this contract with the cost for these safety controls considered to be included in the various unit bid prices of this contract. No compensation shall be made for the provision of traffic cones or other devices for which items are not provided for in the Contract.

All safety signing, temporary pavement markings, reflectorized and lighted drums, and all other safety controls used for construction operations shall conform to the NCHRP 350 and the MUTCD, Current Edition, for Street and Highways including all amendments.

DEWATERING

The Contractor's attention is directed to construction operations which may occur in the vicinity of wetland areas, pond, brooks and/or surface or subsurface areas where surface water or groundwater may exist or accumulate. All dewatering and related work shall be conducted in such a manner as to prevent siltation or contamination of any adjacent resource area. Pumping discharge shall not be allowed to enter directly or indirectly into any wetland resource area without prior treatment (filter bags, silt sacks, settling basins, etc.) The Contractor shall include under each pertinent item all labor, materials and equipment necessary to dewater the affected areas for proper installation of the respective items. No additional compensation will be made for dewatering but shall be considered incidental and included in the price for each respective item.

SHEETING AND BRACING

The Contractor shall furnish, place and remove all sheeting and bracing required to support the sides of the trenches or other excavations. The Contractor shall be solely responsible for the safety of the workman and the adjacent facilities from danger of caving and sliding and all work to be done shall be in strict accordance with the Department of Labor, Occupational Safety and Health Administration regulations and suggested practices for construction excavation and/or other applicable codes and regulations.

Special precautions shall be taken to guard against any damage to or settlement of pavements, buildings, walls, pipes, ducts, or other structures and facilities that are adjacent to the work.

The cost of providing and removing sheeting, shoring and bracing shall be included in the cost of various items of work under this contract and no additional compensation will be allowed therefore.

OPEN EXCAVATIONS

All open excavations shall be adequately safe guarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The length of open trench will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Town. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, special construction procedures shall be taken, such as limiting the length of open trench or requiring that the trench shall not remain open overnight.

MAINTENANCE OF WORK SITE

All work areas shall be kept clean by the Contractor. The Contractor shall provide weekly sweeping of streets and gutters and daily sweeping of sidewalks within the Limits of Work, subject to approval of the Engineer.

The Contractor shall also be responsible for sweeping and cleaning of surfaces beyond the limits of the project to clean up material caused by spillage or vehicular tracking during the various phases of the work. Sweeping of sidewalks and streets shall be included in the various items and no additional compensation will be allowed therefore.

MAINTENANCE OF EXISTING TREES

Caution shall be taken by the Contractor not to damage plants by burning, by pumping of water, by cutting live roots or branches, or by any other means. No plants to be saved shall be used for crane stay, guys or other fastenings. Vehicles shall not be parked where damage may result to trees to be saved. Construction materials shall not be stored beneath trees to be saved.

Existing shrubs, vines and groundcover to be saved that are damaged, as determined by the Engineer, shall be replaced with plants of equal size. All costs incurred shall be paid for by the Contractor at his own expense.

Direct soil contamination in root zone area by petroleum, petroleum products or solvents, salts or any other pollutant during construction shall be avoided.

All cutting or trimming of trees to be preserved shall be executed by a Massachusetts Certified Arborist. The Contractor shall provide the Engineer with a copy of the certification prior to any work on trees.

Existing trees adjacent to construction may be protected using Individual Tree Protection or Temporary Tree Protection Fence as specified here in. Trees to remain that, in the judgment of the Engineer, have been irreparably damaged by the Contractor shall be replaced in kind and in size, or with a quantity of 2-inch caliper replacement trees (the quantity of which shall be determined by the Engineer) such that the cumulative caliper of the replacement trees will be up to the equivalent of diameter of the lost tree at breast height. Cost of removal of destroyed tree, including roots and stump, as well as the cost of replacement trees, shall be paid for by the Contractor.

USE OF TOWN HYDRANTS

In accordance with rules and regulations of the Massachusetts Department of Environmental Protection and the Town of Lexington Water Department, the Contractor is required to provide a backflow preventer and obtain a permit from the Department of Public Works before tapping into any hydrant within the Town. **The Town will suspend the work for any violation of this provision.**

It shall be the Contractor's responsibility to ensure that all subcontractors likewise understand and comply with this provision. No hydrant is to be operated by anyone other than the Town of Lexington Water Division without express approval of the Water Superintendent. The town does not guarantee access to water at or near the site, but will allow for access to water during the construction season at 201 Bedford Street.

PERSONAL PROTECTIVE SAFETY EQUIPMENT FOR CONTRACTOR PERSONNEL

The Contractor is responsible to ensure that all personnel, including all subcontractors, working on the project are issued and are wearing all necessary personal protective safety equipment while working within the project limits. This equipment shall include, as a minimum, a hardhat and a safety vest, regardless of the type of work being performed. Other safety equipment shall be added as required to perform the work in which they are engaged and in accordance with all local, state and federal requirements in effect. Safety equipment shall be provided at no additional cost to the Town.

GUARANTEE

The Contractor shall guarantee all materials and equipment furnished and work performed for a period of one (1) year from the date of Substantial Completion. The Contractor warrants and guarantees for a period of one (1) year from the date of Substantial Completion that the completed is free from defects due to faulty materials or workmanship and the Contractor shall promptly make such corrections as may be necessary by reason of such defects including the repairs of any damage resulting from such defects. The Owner will give notice of observed defects with reasonable promptness. In the event that the Contractor should fail to make such repairs, adjustment, or other work that may be made necessary by such defects, the Owner may do so and charge the Contractor the cost thereby incurred. The Performance Bond shall remain in full force and effect through the guarantee period.

MONTHLY PRICE ADJUSTMENT HOT MIX ASPHALT (HMA)

This contract hereby incorporates the MassDOT special provisions for price adjustment clauses for liquid asphalt.

Base Prices for HMA items will be the fixed prices determined to be in place as of the date of bid posted on the MassDOT website. All scheduled work will be performed at the prices in effect at the time the work is performed.

Price adjustments for hot mix asphalt (all asphalt items under section 460) will be made in accordance with Document 00811 published by MassDOT revised July 8, 2016. Asphalt adjustment shall be documented on each invoice with no adjustment shown on invoice one. Invoice two will include the adjusted asphalt cost from the invoice one tonnage and so on. The contractor shall provide documentation and calculations demonstrating the proper adjustment. The base bid for liquid asphalt on this contract shall be the period price at the date of the bid opening as published by MassDOT on its website.

SECTION 02550
CONSTRUCTION SPECIFICATIONS

ITEMS

All Items of work in this Contract shall be governed the Massachusetts Department of Transportation 2020 *Standard Specifications for Highways and Bridges*, including the latest supplements and addendum thereto. Work Items are referenced with Item Numbers and Item Descriptions similar to those currently in use by the MassDOT, Highway Division. Method of Measurement and Basis of Payment for Work Items shall be as called for under the appropriate section of the MassDOT Standard Specifications, and Town Supplemental Division I & II.

The following items reflect special conditions particular to this Project. As such, they amend and/or supplement the provisions governing the Item, as described in the Standard Specifications.

ITEM 101.01 SITE PREPARATION LUMP SUM

The work under this Item shall conform to the relevant provisions of Section 101, and shall include miscellaneous clearing and grubbing, shrub removal not otherwise included under other items of this contract, the removal and stacking of existing materials noted on the plans to be removed, or required to be removed to construct the project, as shown on the plans or as directed by the Engineer and, not otherwise included under other items of the contract.

The work under this Item shall also consist of providing all labor, equipment, materials, incidental work, a Massachusetts certified Arborist (as needed) for tree evaluation, and construction methods necessary to protect existing trees, shrubs, and other plant materials to remain from damage as a result of the Contractor's operations.

The work under this Item shall include, but not be limited to the following:

- Miscellaneous clearing and grubbing within the limits of the work as required to construct the Project, unless features are noted to be retained.
- Removing and proper disposal of all stumps, shrubs, and brush, not noted to be retained and as directed by the Engineer. Work requires prior approval of Engineer.
- Performing preservation work to protect and retain existing high-value trees at Sta. 10+72 41'RT, 11+19 37'RT 21+71 53'LT, and 22+12-51'LT. Work to include root pruning and hand digging or airspade removal of sidewalk pavements and soil within the trees drip-line.
- Providing Tree/Plant Protection as noted on the plans or as otherwise noted by the Engineer. Options for Tree/Plant Protection are detailed on the plans. Estimate about 10 Trees or Shrub Bed Areas to be protected.
- Trimming and proper disposing of waste from trees noted on the plans and/or as required by the Engineer.
- Removing and grubbing trees 8" caliper or smaller as noted on the plans.
- Removing and resetting mailboxes
- Removing and resetting newspaper vending
- Removing and transporting of the 5 Post Top Iron Lanterns currently located on private property between Sta. 23+50+/- and Sta. 24+70+/- shall be transported to JP Carroll's Auto Parts, 700 Waltham Street, Lexington, MA 02421, by the Contractor.

- Removing and transporting granite curb not to be re-used on the project and considered to be of value by the Engineer. These shall be transported to the Town yard and stacked by the Contractor.
- Removing and stacking concrete street light poles (4) as directed by the Engineer to be transported to the Town yard and removing all other concrete light poles within the project limit.
- Removing and Stacking Trash Receptacles located within the project work area (15) to Town yard. Receptacles shall be tagged as Town owned.
- Removing and Stacking Big Belly Trash and Recycling units located within the project work area (4 sets) to Town yard. Units shall be tagged as Town owned.
- Removing and Stacking Bike Racks to Town yard.

Materials to be removed and stacked shall be transported from the work site to the Town/DPW Yard at 201 Bedford Street, Lexington, MA., and carefully stacked as directed by the yard foreman. In the event that any of the above items are determined be the Town to be unsuitable for reuse, they shall be disposed of by the Contractor at no additional cost.

Tree Protection

Prior to any construction activities, the Contractor and his Massachusetts certified Arborist shall walk the site with the Engineer and Town Tree Warden to confirm, which trees shall require protection and determine which measures to be used. The Arborist shall make recommendations on measures to be used. The Engineer will have final decision as to trees and measures.

Tree protection practices shall be in accordance with the International Society of Arboriculture, Savoy, IL 61874 (ISA):Guide for Plant Appraisal and Commonwealth of Massachusetts Highway Department (MassDOT):Specifications Standard Specifications. Tree protection shall also include protecting roots and when necessary appropriately prune roots when excavation is necessary. All temporarilyexposed roots shall be covered with mulch and moistened on a daily basis until final construction application is completed according to the plans. The tree protection fence shall be removed just prior to spreading of loam.

Temporary Tree Protection Fence shall comply with M6.08.1 and shall be brightly colored polypropylene barricade or wooden snow fencing for tree protection or safety fencing. Fencing shall be a minimum of 4 feet high and supported by steel or hardwood stakes spaced at a maximum of 8 feet on center or by other means acceptable to the Engineer.

If the existing trees to be saved within or outside the limit of work line are damaged, and/or existing shrubs, vines and groundcover to be saved are damaged, as determined by the Engineer, they shall be replaced with plants of greater size. All costs incurred shall be paid for by the Contractor at his own expense.

Tree Trimming

Tree Trimming shall be performed under the direct on-site supervision of a Massachusetts Certified Arborist, whose name and qualifications shall be submitted to the Engineer. Work shall be performed by personnel who can demonstrate a minimum of ten years of experience in pruning shade trees along public right of ways. Contractor shall be required to provide a crew, consisting of a bucket truck with operator and grounds man for Pruning and Removal efforts. The use of climbing spurs or spiked shoes shall not be permitted.

Pruning shall be performed in a manner so as to maintain the natural aesthetic characteristics of the species and variety of trees. No topping or dehorning of trees or stubbing back of branches shall be permitted. All cuts shall be made sufficiently close to the parent stem so that wood closure can be readily started under normal conditions. However, cuts shall never be made through the branch collar. Slap cuts and rip cuts will not be allowed.

Pruning will be done in accordance with the National Arborists Association Pruning Standards as found within the Standard Practices for Tree, Shrub and Other Woody Plant Material, ANSI A300. No limb shall be removed to gain access to the interior of the tree by aerial lift. Dense headed trees shall be pruned by climbing.

Pruning performed shall include the provision of proper clearance from utilities, structures, buildings and luminaries, as well as to establish clearances elevation over street and sidewalk surfaces.

The Contractor shall coordinate with utility companies to determine branches or trees requiring removal. Any tree trimming required by utility relocation shall also be included in this work.

COMPENSATION:
Payment under this Item shall be a Lump Sum, which sum shall constitute full compensation for all material, labor, transportation, equipment and incidental work and costs necessary to perform the various items of work noted herein, including the services of a certified arborist, to the satisfaction of the Engineer. Payment shall be prorated over the course of the project, as determined appropriate by the Engineer.

ITEM 103. TREE REMOVED – DIAMETER UNDER 24 INCHES EACH

The work under this Item shall conform to the relevant provisions of Section 101, and shall include clearing and grubbing, of trees over 9-inch and up to 24-inch caliper as shown on the plans or as directed by the Engineer and, not otherwise included under other items of the contract.

The work under this Item shall include, but not be limited to, Clearing and Grubbing of trees at the following locations:

STATION	TREE CALIPER	TREE SPECIES
12+92 LT	13"	Linden
13+62 LT	10"	Linden
15+55 LT	11"	Linden
15+94 LT	9"	Linden
17+19 LT	9"	Linden
17+39 LT	9"	Linden
18+10 LT	10"	Linden
18+33 LT	10"	Linden
17+73 LT	9"	Linden
17+73 LT	11"	Linden
19+20 LT	10"	Linden
19+44 LT	12"	Linden
19+51 RT	14"	Pear
19+68 LT	12"	Linden
19+87 LT	16"	Linden
20+09 LT	10"	Linden
20+29 LT	16"	Linden
20+49 LT	10"	Linden

21+16 RT	11"	Pear
21+95 RT	19"	Pear
25+03 RT	10"	Pear

COMPENSATION:

Payment under this Item shall be by EACH, which sum shall constitute full compensation for all material, labor, transportation, equipment and incidental work and costs necessary to perform the various items of work noted herein, to the satisfaction of the Engineer.

ITEM 120.1 UNCLASSIFIED EXCAVATION CUBIC YARD

The work to be done under this Item shall consist of removing and disposing in accordance with the relevant provisions of Section 120, all the materials obstructing the execution of required work, as shown on the plans and as directed, except for those materials for which payment is made inclusive with work specified to be performed under other items of this Contract.

The work under this Item shall include all excavation, not otherwise included for payment under other items of this contract, including, but is not limited to, the removal and disposal, if necessary, of the following: buried foundations, tree stumps and roots, curbing, concrete slabs, reinforced concrete, rock, pipe, drainage structures, granite, cobblestones, muck, fencing and posts, not otherwise paid for under other Items of this contract. The removal and discarding of curbing not selected for reuse or stacking, as determined by the Engineer shall paid for under this Item. Any Petramat or other fabric material that is encountered during milling operations shall be removed under this item.

Majority of existing sidewalk along Mass Avenue is brick sidewalk with HMA, concrete, or reinforced concrete base. The removal and discarding of bricks not selected for reuse or stacking, as determined by the Engineer shall paid for under this Item. The removal of brick base shall be paid under this item.

The silva cell system will be installed under the sidewalk on north side of the Mass Ave as shown on the plans and details. The excavation for installation of silva cell shall be paid under this item.

Structural soil is proposed under sidewalks on both sides of Mass. Ave. as shown on the plans. The excavation for installation of structural soil shall be paid under this Item.

Work under this Item shall also include excavation of bituminous concrete pavement at limits of resurfacing and reconstruction; box widening, roadway narrowing, and at curb lines in areas of resurfacing. Edges of excavation made in existing pavements shall be squared by saw cutting with power driven tools to provide a neat, clean edge for joining new pavement as shown on the Plans. Ragged, uneven edges shall not be accepted. Pavement areas that have been broken or undermined shall be edged neatly with a minimum disturbance to remaining pavement. Payment for this saw-cutting work shall be considered included under this Item.

Before starting any excavation, the Contractor shall become familiar with the area and verify all utilities, sprinkler systems, and other sub-surface features in the project area to make sure that the excavation will not unnecessarily disturb or damage such features. He will coordinate his construction activities with the owners of such features and obtain approval or permits, if necessary, prior to starting the excavation. Any damage done to sub-surface features during the construction process will be the responsibility of the Contractor and will be repaired by the Contractor at his own expense. If the owner so wishes, he will repair the damage himself and bill the Contractor for his expenses.

When working next to existing retaining walls or structure, the Contractor shall exercise extreme caution not to disturb existing walls or structure. If existing walls or structure are disturbed, they shall be reconstructed at the Contractor's expense to thoroughly match the existing in color, texture, material and workmanship.

Payment under this Item shall be at the Contract Unit Price bid per Cubic Yard, which price shall include all labor, materials, tools, saw-cutting, and equipment necessary to complete the excavation and disposal of unwanted or surplus material, not cover by other items of this contract.

ITEM 141.1 TEST PIT FOR EXPLORATION CUBIC YARD

The work to be done under this Item shall conform to the relevant provisions of Section 140 supplemented by the following:

Test pit shall be excavated where designated on the plans and/or as directed and approved by the Engineer in advance. The maximum pay limits for a test pit shall be no more than 4’ x 4’ to the depth approved by the Engineer, unless otherwise directed by the Engineer.

Payment for work under this Item shall be at the Contract Unit Price bid per Cubic Yard, which price shall be full compensation for labor, materials, equipment, tools, saw-cutting, excavation, the taking and recording of measurements, proper backfilling, fine grading and compaction, and other incidentals necessary to satisfactorily complete the work. Test pits made without the expressed prior approval of the Engineer shall not be compensated for.

Payment for temporary HMA patch shall be paid under Item 472.

ITEM 151. GRAVEL BORROW CUBIC YARD

Work under this Item shall conform to the relevant provisions of Subsection 150 of the Standard Specifications and the following:

Gravel borrow shall conform to Material Specifications M1.03.0 (Type b).

Gravel Borrow shall be placed with a maximum lift thickness of 6 inches. Where required, trenches shall be backfilled with approved granular materials and properly compacted to the 95 percent of the maximum density as determined by ASTM D1557 (Modified Proctor). All other gravel areas shall be compacted to the minimum density of 95 percent of the maximum density. Any settlements or other defective work and material shall be promptly repaired or replaced at the Contractor’s expense. The density of the compacted fill shall be determined by the ASTM D6938 Nuclear Method or latest ASTM standard.

Payment for work under this Item shall be at the Contract Unit Price bid per Cubic Yard, which price shall include all labor, materials, equipment, compaction and testing necessary to complete the work of this Item

ITEM 170. FINE GRADING AND COMPACTING – SUBGRADE AREA SQUARE YARD

The work to be done under this Item shall conform to the relevant provisions of Section 170 supplemented by the following:

Payment includes fine grading and compaction of the roadway sub-base. Payment for fine grading and compaction of other locations shall be paid for under other items of the contract.

ITEM 153. CONTROLLED DENSITY FILL – EXCAVATABLE CUBIC YARD

The work to be done under this Item shall conform to the relevant provisions of Section 153 supplemented by the following:

The work to be done under this Item shall conform to the relevant provisions of Section M4.08.0 supplemented with the following:

Controlled density backfill shall be Type 2E (Excavatable) and used in trenches Engineer in mill and overlay areas, where authorized in advance by the Engineer.

Controlled Density Fill shall be shielded from other utility piping so as to not have material contact between the CDF and the adjacent piping.

Steel road plates shall protect the CDF until the fill reaches a point that it will not be deformed by traffic passing over it. Per direction of the Engineer, CDF may be left one foot below bottom of asphalt with remaining backfill material placed after appropriate curing time as directed by the Engineer. Additional backfill will be paid at contract unit price for the material used as directed.

Payment for work under this Item shall be at the Contract Unit Price bid per Cubic Yard, which price shall be full compensation for shielding, labor, materials, equipment, tools and other incidentals necessary to satisfactorily complete the work.

ITEM 201. CATCH BASIN EACH
ITEM 202. MANHOLE EACH
ITEM 204.11 GUTTER INLET - SPECIAL EACH

The work to be done under this item shall conform to the relevant provisions of Section 201, Basins, Manholes and Inlets, Supplemental Specifications as Described in Division I and II of Town of Lexington, amended and supplemented and followings:

All catch basins shall be constructed as shown in MassDOT Standard Drawing E 201.4.0 with 4 foot sump (deep sump).

Flat top sections shall be substituted for conical sections in areas of low cover. It shall be the responsibility of the Contractor to determine the appropriate type of top for each location. Flat top structures shall have a minimum 28 day compressive strength of 4000 psi, reinforced for AASHTO H-20 loading with ASTM A 615 Grade 60 steel. No additional payment will be made for flat top structures.

Alternate eccentric cone sections shall be substituted for concentric cone sections in areas existing site features or utility obstructions warrant. No additional payment will be made for eccentric cone sections.

Gutter Inlet – Special shall be constructed as shown on the detail provided in the construction drawings and in accordance with applicable sections of Section 201 of the Standard Specifications.
Connections to existing pipe shall also be included in the cost of the structures. If existing pipe is to be abandoned, the end of existing pipe shall be plugged as specified in Section 200. The removal of existing pipe due to conflicts with the proposed drainage structures shall be considered incidental to these Items. The remaining portion of the existing pipe to remain shall be plugged. The depth of the plug shall not be less than 8” in thickness in conformance with the MassDOT Standard Specifications, Section 201.62. Plugs shall be incidental to these items.

Where new catch basins or manholes are shown on the drawings to be constructed over existing pipes, the work shall also include the connecting of the pipe to the structures and the necessary cutting and removal of the existing pipe within the structures. The existing pipe shall be neatly cut to provide a smooth uniform face flush with the inside wall surface of the structure and totally removed or neatly cut longitudinally and partially removed to retain the lower half of the existing pipe barrel to form the required (manhole) shaped invert.

Catch basins, manholes, and gutter inlets shall be placed on 6” crushed stone (M2.01.1) foundation as directed by the Engineer.

Payment for work under these Items shall be at the Contract Unit Prices bid per Each, complete, regardless of depth, and shall include all excavation regardless of depth, sawcutting, shoring, bracing, dewatering, crushed stone base, backfilling, compaction, asphalt concrete collars, plugs, manhole inverts and all labor, tools, and materials required.

Payment for structure frames & covers (or grates) shall be paid under Item 222.3.

ITEM 220.11 STRUCTURE ADJUSTED EACH
ITEM 220.21 STRUCTURE REBUILT FOOT
ITEM 220.51 STRUCTURE REMODELED EACH

Work under these Items shall conform to the relevant provisions of Section 200, Supplemental Specifications as Described in Division I and II of Town of Lexington, amended and supplemented as following:

This work shall be applicable to all types of municipal structures, including drainage and sanitary, where existing castings are to remain.

All rebuilt and remodeled structures shall be set to allow for 2 courses of mortared clay brick between the frame and the structure. The use of cement concrete brick will not be allowed. All frames shall be set in a asphalt concrete collar. Asphalt concrete collars shall be brought to a height that will allow placement of the full depth of the specified pavement wearing surface or a minimum of 3.5” of hot mix asphalt above the collar. Asphalt concrete collars shall be tacked coated with RS-1 Asphaltic Emulsion prior to the placement of pavement. No additional compensation for asphalt concrete collars shall be allowed.

All dirt and debris caused by the Contractor shall be cleaned by the Contractor at his own expense.

COMPENSATION:

Adjust new structures in full depth construction areas
If needed, the cost of raising new structures from a plated depth to the base course and raising the structures from the base course to finished grade shall be included in the cost of new structures and no additional payment shall be made therefore.

Adjust existing structures in areas of full depth pavement construction
The cost of lowering of existing structures shall be considered incidental to Item 120.1, Unclassified Excavation and no additional compensation shall be made therefor. Raising the structures from a plated depth to base course or directly to finished grade shall be paid for under Item 220.51, Structure Remodeled. The Contractor shall also be compensated for up to one adjustment under Item 220.11, if a remodeled structure is initially only brought to base course level, as noted above.

Adjusting existing structures in mill and overlay areas
The contract allows for one adjustment for structures in mill/overlay areas paid for under Item 220.11, unless structure is a remodel. No additional payment will be made to adjust from base course to top course elevation, such as in the case of a winter shut down.

Adjustments for new castings shall be considered to be included in payment under the respective casting item. All existing castings to be reused shall be limited to one payment under Item 220.11. No additional payment will be made for adjustments required by construction phasing or winter shutdown.

Removing and Stacking of existing castings shall be considered incidental to the appropriate drainage structure item, whether it be adjusted, change in type, remodeled, abandoned, or proposed. No additional compensation shall be for the removing and stacking of these castings.

All existing castings which are salvageable as determined by the Engineer shall be removed, stored, transported and reset to locations within the project as part of the work of these Items. Damaged or obsolete castings shall be replaced with new castings, as directed by the Engineer. New Frames and Covers or Grates shall be paid for under Item 222.3.

The Contractor shall properly dispose of the non-salvageable castings. No additional compensation will be made for disposal for these castings.

ITEM 222.3 FRAME AND GRATE (OR COVER) MUNICIPAL STANDARD EACH

The work done under this Item shall conform to the relevant provisions of Section 201, Supplemental Specifications as Described in Division I and II of Town of Lexington, amended and supplemented as following:

Frames four-inches in height shall be substituted for standard frames in areas of low cover as detailed on the plans or as directed by the engineer. Four-inch frames shall be compatible with Town Standard grates (or covers) as described in Supplemental Specifications as Described in Division II of Town of Lexington, and shall be as manufactured by East Jordon Iron Works, or approved equal. No additional payment shall be made for four-inch frames. Payment under this Item shall be at the Contract Unit Price bid per Each, which price shall include furnishing and installing frame, regardless of height, grate (or covers) including transportation on site to the location of installation, any adjustments to new castings required to meet finished grade, clay brick, asphalt concrete collars and all miscellaneous labor, materials or equipment to complete the installation. No additional payment will be made for new castings to be reset from binder to surface course elevation, such as in the case of a winter shut down.

ITEM 238.08 8 INCH DUCTILE IRON PIPE FOOT
ITEM 238.10 10 INCH DUCTILE IRON PIPE FOOT
ITEM 241.12 12 INCH REINFORCED CONCRETE PIPE FOOT

This work under these Items shall conform to the relevant provisions of Section 230 of the Standard Specifications, Supplemental Specifications as Described in Division I and II of Town of Lexington, amended and supplemented as following:

Ductile Iron drain pipe shall be used in areas, where insufficient cover or utility obstructions warrant, at locations detailed on the plans, and/or as directed by the Engineer.

Pipe trenches shall be backfilled with suitable material or gravel borrow and compacted in 6 inch lifts to meet the required compaction level. Trenches shall be backfilled and properly compacted to the minimum density of 95 percent of the maximum density as determined by ASTM D1557 (Modified Proctor). Any settlements or other defective work and material shall be promptly repaired or replaced at the Contractor’s expense. Density testing shall be required as determined by the Engineer. The Engineer will identify the locations for testing to be paid for by the Contractor.

The work shall include the incidental adjustment of other utilities as required to install proposed pipe. All existing drainage pipe that is impacted by the installation of proposed pipe shall be removed to the extent required and disposed of by the Contractor as part of the work under this Item. Pipe may be abandoned in place, if approved by the Engineer. Where new pipe connects into an existing manhole, inverts shall be rebuilt or modified, as needed, to match proposed conditions under this Item.

The removal of existing pipe due to conflicts with the proposed drainage pipes shall be considered included under these Items. The remaining portion of the existing pipe to remain shall be plugged. The depth of the plug shall not be less than 8” in thickness in conformance with the MassDOT Standard Specifications, Section 201.62. Plugs shall be incidental to these items.

Payment under these Items shall be at the Contract Unit Prices bid per Foot, complete in place; including all trench excavation, regardless of depth; saw cutting, backfilling; shoring and bracing; dewatering, crushed stone bedding if needed, compaction testing, the removal of existing pipe, plugs, modifying inverts, the maintenance of flow, and the protection from and cleaning of related construction debris from the affected portions of the existing drainage system.

Unsuitable trench material shall be disposed of by the Contractor with no additional payment. Gravel Borrow for backfill, if required shall be paid for under Item 151.

ITEM 347. SERVICE PIPE - COPPER FOOT

This work under these Items shall conform to the relevant provisions of Section 301 of the Standard Specifications, Supplemental Specifications as Described in Division II of Town of Lexington, amended and supplemented as following:

The work includes furnishing all labor, materials and equipment necessary to install service pipe, of the appropriate size, from the water main to property line that may be impacted by the proposed work. The new service pipe shall match the existing service pipe size and material.

Payment shall be at the Contract Unit Price bid per Foot and which price shall constitute full payment for all pipe, regardless of size, related materials, labor, equipment, tools, fittings and any other incidental items to complete the work as specified, as shown on the Plans and/or as directed by the Engineer. The work shall also include the removal and proper disposal of existing service lines, as required for the installation of the new service.

ITEM 357. GATE BOX EACH

ITEM 358. GATE BOX ADJUSTED EACH

Work under these Item shall conform to the relevant provisions of Section 301 of the Standard Specifications, and the following:

This work will consist of adjusting gate boxes and service boxes, regardless of size, to conform to the proposed line and grade. Boxes and stops located in driveways or in street pavement shall have collars. Gates and stops in sidewalk areas are not required to have collars.

Gate boxes or curb stops damaged by the Contractor’s operations will be replaced by the Contractor at his own expense with new gate boxes and stops in accordance with the Town’s standards.

Boxes and stops found to be inoperable due to no fault of the Contractor shall be replaced under Item 357 with new boxes and stops, regardless of size, with new gate boxes and stops in accordance with the Town’s standards.

If Water gates and gas gates need to be lowered and plated in full depth area shall be considered incidental to the unclassified excavation. The Contractor shall also be compensated for up to one adjustment under Item 358.

Payment under this Item shall be at the Contract Unit prices bid per Each, which price shall be full compensation for all labor, equipment, materials to adjust or new gate boxes, service boxes and curb stops regardless of size to finish grade, or the removal and disposal of old boxes or stops not fit for reuse and installation of new replacement gate and service boxes, and all incidentals necessary to complete the work to the satisfaction of the Engineer.

ITEM 376.2 HYDRANT - REMOVED AND RESET EACH
ITEM 376.21 HYDRANT - REMOVED AND REPLACED EACH

This work under these Items shall conform to the relevant provisions of Section 301 of the Standard Specifications, Supplemental Specifications as Described in Division II of Town of Lexington, amended and supplemented as following:

The work of Item 376.2 shall include furnishing and installing of new hydrant as described in hydrant detail, Six Inch Ductile Iron Water Pipe, Fittings, Couplings required to relocate the hydrant to its new location.

The work of Item 376.21 shall include furnishing and installing of new hydrant, Fittings, Couplings required to replace the existing hydrant.

All hydrants to be “Removed & Reset” shall be done so one hydrant at a time. The Contractor shall have all the necessary tools, materials, equipment and workmen needed to do the work on site and ready before any hydrant is removed. The Contractor shall give at least 48 hours written notice to the Town Fire Department and Water Department prior to working on any hydrant. The Town Water Department will determine if the existing hydrant should be replaced with a new hydrant to be provided by the Town. Hydrants which will be out of service for more than twenty-four (24) hours shall be replaced by temporary hydrants at no additional cost to the Project.

Hydrants shall be set as shown on the drawings. Hydrants shall be set plumb with the steamer nozzle facing the roadway. Hydrants shall be set so that manufacturers "bury" mark or ground line is at finish grade. If there is no “bury mark” on the hydrant, the bottom of the breakaway feature shall be a minimum of 2” and a maximum of 4” above finished grade.

Payment for work under these Items will be made at the Contract Unit Price bid per Each complete, which price shall include removal and replacing of existing hydrants at new locations or existing location, all excavation, backfill, furnishing and installing required sections of new 6 “ DI pipe, new hydrant, valve , all labor, materials, equipment and incidental costs required to complete the work. No separate or additional payment shall be made for new pipe, crushed stone drainage well, concrete thrust block, fittings, connection to existing, tie rods, connection couplings, restraining glands, megalugs, extension sections. The work shall also include the abandonment of the existing hydrant connection as noted above.

If required, the work of this Item shall also include the transport and stacking of removed but salavageable hydrants to the Town yard. Nonsalvageable hydrant as determined by the Engineer shall become the property of the Contractor and shall be properly disposed of off the site with no additional payment made.

ITEM 390.01 IRRIGATION SYSTEM MODIFIED FOOT

All work shall be done in accordance with the relevant Sub-sections of the MassDOT Standard Specifications.

Where an irrigation system is encountered during the construction, the piping system and sprinkler heads shall be removed and reset at new locations or modified, as directed by the Engineer. The exact locations will be determined by the Engineer in the field to the satisfaction of the involved property owner.

Existing sprinkler system impacted due to the construction as identify on the plan or encountered during construction operations shall be carefully removed and reset on the property as directed by the Engineer. The work also includes disconnecting existing system with coordination with owner.

All sprinkler heads and pipes shall be removed carefully, and the contractor will be held responsible for any damage done and shall replace or repair the damaged item as directed by the Engineer at his own expense.

Sprinkler heads and the pipes shall be relocated to new locations or eliminated as determined by the Engineer. All necessary piping shall be provided and installed by the Contractor

The operation of the irrigation system shall be guaranteed by the Contractor for a period of one month from the date of completion of work.

Item 390.01 will be measured in place by the Foot of irrigation tubing removed and reset in its final position.

Item 390.01 will be paid at the contract unit bid price per Foot, which Contract unit price shall include all work necessary or incidental for complete in place relocated sprinkler irrigation tubing, sprinkler heads, testing and incidentals required to complete the work.

Installation of new Irrigation system will be paid under Item 390.3.

ITEM 390.1 4” PERF CORRUGATED PIPE FOOT
ITEM 390.2 12 INCH PVC PIPE WITH SQUARE GRATE EACH

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include installing tree aeration system on the south side of Mass, Ave. as shown on the drawings.

SUBMITTALS

The Contractor shall provide shop drawing showing size, materials, construction for the aeration system.

MATERIALS

Polyvinyl pipe and fittings shall be Schedule 40 meeting requirements of ASTM D 1785.

Perforated pipe (around root ball) shall be corrugated polypropylene flexible pipe with fabric sock.

12-inch square metal frame and ADA compliant grate shall be ductile iron and sized to fit the 12-inch PVC riser pipe. Grate shall be hot-dipped galvanized, and powder coated black.

METHOD OF CONSTRUCTION

Slope on aeration pipe installed shall be “flat” to ½ percent. The work shall include the incidental adjustment of other utilities as required. Pipe trenches shall be backfilled with suitable material or gravel borrow and compacted in 6-inch lifts to meet the required compaction level.

Where proposed pipe connects to proposed structures, the Contractor shall provide all materials, equipment and labor to make connections to structures, including flexible couplings per recommendations of the manufacturer.

Where new drains tie into existing catch basins or manholes, inverts shall be rebuilt or cut to match proposed conditions as part of the work under this Item.

All existing drainage pipe that becomes non-operational as a result of proposed drainage improvements shall be removed and disposed of by the Contractor as part of the work under this Item. Pipe may be abandoned in place, if approved by the Engineer.

The work under these Items shall the incidental adjustment of other utilities as required to install proposed pipe.

12-inch square grate shall be set flush with new brick sidewalk.

All existing grates to remain shall be removed, cleaned, hot-dipped galvanized, and powder coated black.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for 4 inch Perforated PVC Pipe shall be made at the Contract Unit Prices bid per linear foot including filter sock complete in place; including furnishing and installing pipe, couplings, trench excavation, regardless of depth; saw cutting, backfilling; shoring and bracing; gravel borrow bedding, compaction testing, the removal or abandonment of existing pipe, modifying inverts, and the maintenance of flow and the protection from and cleaning of related construction debris from the affected portions of the existing aeration system.

12 inch PVC Pipe with Square Grate will be paid at the contract unit price per Each, complete regardless of depth, and shall include all excavation, required cutting, shoring, bracing, crushed stone, geotextile fabric, bedding and backfilling, compaction, concrete collars, metal grate and; all labor, tools, and materials required.

ITEM 390.3 IRRIGATION SYSTEM LUMP SUM

This work under this item shall include the furnishing and installing of sleeving, pipe, drip equipment, wiring and equipment necessary for a complete and functioning irrigation system for the landscape areas indicated in accordance with these Special Provisions, as detailed in the specifications and as directed by the Engineer.

SUBMITTALS

Submit, in accordance with Section 5.00, product data and materials of construction. Submittals shall include at least the following:

A. Drip Equipment and Accessories
B. Deep Drip Stake and Emitters
C. Aeration Pipe

D. Aeration Riser with Grate
E. Valves: Manual and Automatic
F. Soil Moisture Controller
G. Soil Moisture Sensors
H. Decoders
I. Surge Arrestors
J. Valve Boxes
K. Pipe and Fittings
L. Sleeving Pipe
M. Electrical Conduit
N. Cable and Connectors
O. Quick Coupling Valves
P. Swing Joints
Q. Rain Sensor
R. Grounding Equipment
S. Flow Sensor
T. Master Valve
U. Miscellaneous Materials

WORK TO BE DONE

Work to be done includes furnishing labor, materials, equipment and services required to complete irrigation work as specified herein and shown on the drawings.

The irrigation system described within the irrigation plans and details, and specifications represents a two controller, landscape irrigation system supplied from potable municipal water. The system shall automatically irrigate, using drip irrigation and deep drip stakes as indicated, the landscaped areas as shown on the planting plans.

System shall include a rain sensor for each controller.

Mechanical points of connection for the irrigation system shall be to two (2) existing irrigation water supply points of connection where indicated on the drawings at the Cary Memorial Library and at 1625 Massachusetts Avenue. The Cary Memorial Library water connection shall require upsizing an existing 1-inch copper pipe to 1.5-inch, interior to the building from the backflow preventer to the exterior of the building, for +/- 25 feet. The existing 1-inch backflow preventer shall remain in place. The existing 125 Massachusetts Avenue water connection is adequate and consists of 1-1/2-inch copper pipe, 1-1/2-inch meter and 1-1/2-inch backflow preventer. The Contractor shall connect to existing irrigation piping at 125 Massachusetts Avenue, exterior to the building.

Electrical points of connection for the irrigation system shall be a 120-volt power supply at both the Cary Memorial Library and at 125 Massachusetts Avenue as indicated on the drawings. Remove existing controllers from each of these locations and return to owner. Wiring of new irrigation controllers to the 120-volt power supply shall be by a licensed electrician.

Trench excavation, backfilling and bedding materials, together with the testing of the completed installation shall be included in this work.

Work shall be constructed and finished in every respect in a good, workmanlike and substantial manner, to the full intent and meaning of the drawings and specifications. Parts necessary for the proper and complete execution of the work, whether the same may have been specifically mentioned or not, shall be done or furnished in a manner corresponding with the rest of the work as if the same were specifically herein described.

Record drawings as well as Operating & Maintenance Manual generation, in accordance to these specifications shall also be included in this work.

EXAMINATION OF CONDITIONS

Contractor shall fully inform himself of existing conditions on the site before submitting bid and shall be fully responsible for carrying out the work required to fully and properly execute the work of the Contract, regardless of the conditions encountered in the actual work. No claim for extra compensation or extension of time will be allowed on account of actual conditions inconsistent with those assumed, except those conditions described in the GENERAL CONDITIONS.

QUALITY ASSURANCE

Installer: A firm which has at least five (5) years' experience in work of the type and size required by this section and which is acceptable to the Engineer.

References: Supply five references for work of this type and size with bid including names and phone numbers of contact person(s).

REFERENCE STANDARDS

ASTM: D1784 Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds.

ASTM: D1785 Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and CL200.

ASTM: D2464 Threaded Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.

ASTM: D2466 Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

ASTM: D2564 Solvent Cements for Poly (Vinyl Chloride) (PVC) Plastic Pipe Systems.

ASTM: D2737-99 Polyethylene (PE) Pressure rated tube.

National Standard Plumbing Code (NSPC)

National Electric Code (NEC)

National Sanitary Foundation (NSF)

American Society of Agricultural and Biological Engineers (ASABE)

Underwriters Laboratories, Inc. (UL)

Occupational Safety and Health Administration (OSHA)

TESTS

Pressure: Contractor shall field verify static and dynamic pressure before commencement of work. Any deviation from calculated requirements shall be reported to the Engineer before start of work.

Coverage Test: After completion of the system, test the operation of entire system and adjust as directed by the Engineer. Demonstrate to the Engineer that irrigated areas are being adequately covered. Furnish and install materials required to correct inadequacies of coverage where the system has been willfully installed or when it is obviously inadequate.

Engineer shall be notified 7 days in advance for observations.

DELIVERY, STORAGE AND HANDLING

Store and handle materials in compliance with manufacturer instructions and recommendations. Protect from possible damage. Minimize on-site storage.

GUARANTEE

Obtain in the Town of Lexington’s name the standard written manufacturer's guarantee of materials furnished under this section where such guarantees are offered in the manufacturer's published product data. These guarantees shall be in addition to, and not in lieu of, other liabilities.

In addition to the manufacturers guarantees warrant the entire irrigation system, both parts and labor for a period of one (1) year from the date of acceptance by the Engineer.

As part of the one-year warranty perform the first year-end winterization and spring start-up for the irrigation system.

Should any problems develop within the warranty period because of inferior or faulty materials or workmanship, they shall be corrected to the satisfaction of the Engineer at no additional expense.

A written warranty showing date of completion and period of warranty shall be supplied upon completion of the project.

MAINTENANCE AND OPERATING INSTRUCTIONS

Include in Bid an allowance for four (4) hours of instruction of Town of Lexington’s personnel upon completion of check/test/start-up/adjust operations by a competent operator (Engineer’s office shall be notified at least one (1) week in advance of check/test/start-up/adjust operations).

Upon completion of work and prior to application for acceptance and final payment, a minimum of three (3), three ring, hard cover binders titled MAINTENANCE AND OPERATING INSTRUCTIONS FOR THE LEXINGTON TOWN CENTER IRRIGATION SYSTEM, shall be submitted to the Engineer office. After review and approval, the copies will be forwarded to the Engineer. Included in the Maintenance and Operating binders shall be:

A. Table of Contents

B. Written description of Irrigation System.

C. System drawings:

  1. One (1) copy of the original irrigation plan;
  2. One (1) copy of the Record Drawing;
  3. One (1) copy of the controller valve system wiring diagram

D. Listing of Manufacturers.

E. Manufacturers' data where multiple model, type and size listings are included; clearly and conspicuously indicating those that are pertinent to this installation.

   1. "APPROVED" submittals of irrigation equipment;
   2. Maintenance: including complete troubleshooting charts.
   3. Parts list. User's Manuals
   4. Names, addresses and telephone numbers of recommended repair and service companies.
   5. A copy of the suggested "System Operating Schedule" which shall call out the controller program required (zone run time in minutes per day and days per week) in order to provide the desired amount of water to each area under "no-rain" conditions.

F. Winterization and spring start-up procedures.

G. Guarantee data.

PROCEDURE
Notify Town departments and/or public utility owners concerned, of the time and location of any work that may affect them. Cooperate and coordinate with them in the protection and/or repairs of any utilities.

Provide and install temporary support, adequate protection and maintenance of structures, drains, sewers, and other obstructions encountered. Where grade or alignment is obstructed, the obstruction shall be permanently supported, relocated, removed or reconstructed as directed by the Engineer.

MATERIALS

GENERAL
Materials to be incorporated in the system shall be new and without flaws or defects and of quality and performance as specified and meeting the requirements of the drawings and specifications. Material overages at the completion of the installation shall be removed from the site.

No material substitutions from the irrigation products described in these specifications shall be made without prior approval and acceptance from the Engineer.

PVC IRRIGATION PIPE
Pipe shall bear the following markings: Manufacturer's name, nominal pipe size, schedule or class, pressure rating in psi, and date of extrusion.

Pipe in sizes 1-1/2 inch and smaller (except for lateral pipe in planting zones) shall be PVC, Class 200, Type 1120, SDR 21, Solvent-Weld PVC, conforming to ASTM No. D2241 as manufactured by Ipex, JM Eagle, Silverline or equal.

Mainline PVC pipe in sizes 1-1/4 inch shall be PVC, Schedule 40, Type 1120, Solvent-Weld PVC, conforming to ASTM No. D2466 as manufactured by Ipex, JM Eagle, Silverline or approved equal.

PVC IRRIGATION FITTINGS
Fittings for solvent weld PVC pipe shall be Schedule 40 solvent weld PVC fittings as manufactured by Dura, Lasco, Spears or equal.

Fittings shall bear manufacturer's name or trademark, material designation, size, and applicable I.P.S. schedule.

PVC threaded connections in and out of valves shall be made using Schedule 80 toe nipples and Schedule 40 couplers or socket fittings. Schedule 40 threads shall not be used for installation.

PVC solvent shall be medium set, NSF approved, for Type I and Type II PVC pipe, and Schedule 40 and 80 fittings. Cement is to meet ASTM D2564 and FF493 for potable water pipes. PVC solvent cement shall be Rectorseal Gold, IPS Weld-ON 711, Oatey Heavy Duty Cement or equal, and shall be used in conjunction with the appropriate primer. Primer shall be NSF approved, and formulated for PVC pipe applications. Primer is to meet ASTM F 656. Primer shall be Rectorseal Jim PR-2, IPS Weld-ON P-68, Oatey Primer for PVC and CPVC, or equal. Clear primers and cements shall not be approved.

Nipples to be schedule 80 PVC.

POLYETHYLENE IRRIGATION PIPE

Lateral pipe 1-1/4 inches and below for planting zone lateral pipe and deep drip stake ring feeders as indicated on the details shall be installed with polyethylene (PE3408) pipe, SIDR 15, Class 100, Type III, Grade 3, Class C conforming to ASTM D2239, with a minimum pressure rating of 100 psi as manufactured by Charter, Cresline, Oil Creek or approved equal.

POLYETHYLENE IRRIGATION FITTINGS

Fittings for polyethylene headers shall be insert PVC or Nylon type fittings. Fittings shall conform to NSF standards and be attached with two (2) offset dog-eared stainless-steel clamps per barb. Clamps shall be as manufactured by Oetiker, Murray or approved equal.

Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage. Fittings shall be per ASTM D2609 as manufactured by Dura, Lasco, Spears or approved equal.

PVC PIPE SLEEVES

Pipe sleeves where designated beneath non-soil areas (except roadways) shall be PVC, Class 160 water pipe as manufactured by Ipex, JMM, National or equal. Minimum sleeve size to be 3-inch.

COPPER PIPING AND FITTINGS

Copper Pipe shall be Type K, hard tempered ASTM B88.

Copper fittings shall be wrought copper, solder joint type in accordance with ASTM B828-00.

Joints shall be soldered with silver solder ASTM B32, Grade 95TA up to 250 degree using non-corrosive flux.

Supply only pipes and fittings that are marked by the manufacturer with the appropriate ASTM designations and pressure ratings and are free from cracks, wrinkles, blisters, dents or other damage.

Piping shall be clearly marked as NON-POTABLE PIPE. Copper pipe shall only be used on the interior of the building until the pipe is 2-feet below grade on the exterior of the building connected with male pipe threads to the exterior isolation gate valve.

WIRE CONDUIT

Conduit for wiring beneath non-soil areas (except under/in roadways) shall be PVC, SCH-40 conduit with solvent-weld joints, as manufactured by Carlon, Cresline, JMM or equal. Minimum conduit size shall be 1-1/2-inch.

Conduit for wiring beneath/in roadways shall be PVC, SCH-80 conduit with solvent-weld joints, as manufactured by Carlon, Cresline, JMM or equal. Minimum conduit size shall be 1-1/2-inch.

Sweep ells shall be standard electrical type PVC schedule 40 or schedule 80 long sweep elbows. Cap sweep ell with tri-plug with the ring for securing nylon pull rope.

Conduit for above ground wiring shall be Schedule 40 galvanized steel electrical conduit.

ELECTRIC CONTROL VALVES

Electric control valves shall be one-inch remote control, diaphragm type, fiberglass or reinforced nylon body plastic valves with manual flow control, manual bleed screw and 200 psi pressure rating.

Valves shall be manufactured by Rain Bird model PEB, Hunter Industries model ICV, Toro 220P or approved equal.

VALVE BOXES

Valve boxes shall be manufactured from unformed resin with a tensile strength of 3,100-5,500 psi conforming to ASTM D638. Boxes shall be green or black in color. The green color shall be used In the planting area.

Valve boxes for manual flushing valves on deep drip stake zones shall be 6-inch round valve boxes with metal detection.

Valve boxes for small isolation valves, wire splices and quick coupling valves shall be 10-inch round valve boxes with metal detection, T-top lids and bolt down covers. Splice boxes shall have gray lids.

Valve boxes for single valves with isolation and dual 1 inch and 1-1/2-inch electric valves with isolation shall be 12-inch standard valve boxes with metal detection, T-top lids and bolt down covers. When multiple 1 inch and 1-1/2-inch electric valves are installed in the same area, they are to be installed two (2) valves per box in a 12-inch standard box.

Valve box extensions shall be provided and installed as required for proper box depth. Valve box extensions shall be made by the same manufacturer as the box.

Valve boxes shall be manufactured by Highline Products, Olde Castle Specification Grade, NDS Pro Series or approved equal.

Where located in pavement, valve/assess boxes for aeration/irrigation service and venting shall be 9” square drainage basins with cast iron grated covers. Drainage basin shall be manufactured of structural-foam polyolefin with UV inhibitor, black in color. Drainage basin shall be provided with universal outlet adapter to securely connect 4 inch corrugated and perforated aeration pipe to drainage basin. Drainage basin shall be manufactured by Old Castle, NDS, Carson or equal.

Drainage basin grated cover shall be 9”x9” square, heavy duty cast iron with black powder coating. Painting of grate shall use a two-step painting process where the cast iron is first undergoes hot dip galvanizing followed by powder coating. Final paint color shall be as approved by the Town of Lexington. Cover shall be ADA compliant, have a minimum load rating of H-20 and be able to be securely fastened to the catch basin by means of stainless steel screws. Drainage basin cover shall be manufactured by Old Castle, NDS, Carson or equal.

Irrigation valve boxes and service hand holes where located in pavement not for the purpose of soil aeration shall be 9” square, 12” standard or sized as necessary for access boxes, manufactured of concrete, polymer concrete or Fibrelyte. Box cover shall be solid concrete, polymer concrete or cast iron, rated for H-20 loading. Cast iron covers shall be hot-dipped galvanized followed by powder coat painting. Access box shall be manufactured by Highline, Old Castle Precast or equal. Final cover color shall be approved by the Town of Lexington.

AUTOMATIC CONTROLLER
Controller shall be able to operate:
Up to 200 zones along a two-wire path and conventional wire paths.
Up to 25 moisture sensors.
Up to 6 pause device inputs (3 normally closed along the two-wire path and 3 hard-wired normally closed pause interrupts).
Up to 4 normally open or normally closed master valves.
Up to 4 flow meters.
Up to 110 devices on a two-wire path.

Controller shall be equipped with a circuit board to allow for conventional wiring and control of a 24-volt master valve.

Controller shall be capable of fully automatic, semi-automatic, and manual operation using a 6-button keypad and 16 position rotary dial that is an integrated part of the controller.

Each controller shall be capable of storing irrigation schedules, monitoring and managing flow without the Central Computer (i.e. if the Central Computer is turned off, removed, or if communication from/to the Central Computer fails, the field controllers will continue to perform moisture and flow management functions).

The controller shall display on-screen instructions making it easier for a user to operate the controller.
The controller shall be able to send alerts to central software at an offsite location utilizing supported devices:
Cellular modem.
Wireless internet modem.
Phone modem.
Ethernet modem.
Direct connection serial interface.

Alerts shall be processed at both the field controller location and/or the Central Computer location.

The controller’s main screen shall be able to display water usage, soil moisture graph, next program run time, temperature of the controller, design flow or actual flow, two-wire current, program reports, pause reports, and a color zone status (watering, soaking, waiting, paused, disabled, and error) without affecting any active programs.

The controller shall be capable of managing ten programs including up to eight start times per program.

The controller shall be able to establish up to 100 separate hydrozones, each with individual adjustable station run times, intelligent soak cycling and percentage adjustability from 30-1000% on all linked zones.

The controller, an interfaced laptop, or central software shall be able to enable, disable, activate or deactivate each zone.

If a program start time is reached while another program is active, the controller shall make a “smart watering” decision. Unfinished zones will have their run times reset and will run before other zones. An “over runtime error” will be logged by the controller.

The controller shall allow an operator to set a “water window,” on a per hour basis, which suspends watering beyond a set time and resumes watering when another window reopens.

The controller programming shall be able to assign watering in minutes or by direct soil moisture monitoring. The program shall be capable of utilizing:

Day interval watering.

7, 14, 21, 28, 30, and 31 day schedules.

A “seasonal adjust” schedule.

The controller shall have the ability to operate up to 15 solenoids concurrently. These 15 solenoids shall be a typical solenoid type requiring approximately 400 milliamps of inrush current and approximately 200 milliamps of holding current.

The controller shall test the normally open master valves once per week for preventative maintenance.

The controller shall have the ability to perform intelligent soak cycles. Intelligent soak cycles describe a watering process applied to a zone where total watering run times include periods of soak times, or non-watering run times.

The controller shall have the ability to manage soak cycles without excessively increasing the total run time.

The controller’s default settings shall configure or program soak cycles.

The controller shall be able to program soak and cycle times by hydrozone removing the need to use multiple start times.

The controller shall have the ability to utilize four master valves, normally open and normally closed types, for flow management on a per program basis. Each master valve shall be assignable to any and all programs.

The controller shall have the ability to manage a pump or other loads switched with relay on a per program basis.

The controller shall be able to support normally open MV/flow combination decoder condition will close master valve and controller will shut down program or programs associated to this MV/Flow decoder.
The controller shall be able to monitor, manage and report flow without the use of a central computer.

The controller shall be able to monitor the system flows in order to shorten water windows and maximize the number of valves running without exceeding system flow capacity, as set by user.

The controller shall be able to operate up to 25 individual soil moisture sensors. A soil moisture sensor manages, programmed irrigation run times or day intervals.

The controller shall be able to auto search, assign and read a TDT technology moisture sensor.

The controller shall have the ability to automatically adjust run times and/or day intervals based on soil moisture readings collected at the plants root zone. Soil moisture readings exceeding an assigned shut-off, will values will override a programmed run time or day interval.

Using a moisture sensor, the controller shall be able to determine the water capacity of the soil and establish a lower limit threshold for the sensor.

The controller will run a 48 hour calibration cycle to determine the moisture level lower/upper limit, water the next start time 150% to 200% of the set run time to determine the soil’s water capacity.

The controller shall be able to automatically re-calibrate the sensor once per month during a normal program start, or maintain a set value.

The controller shall provide a moisture limit adjust that a user may adjust +/- 2%.

The controller shall be able to determine soil moisture and temperature simultaneously on demand.
Controller Hardware:

The controller display shall utilize 16 bit color with a minimum 3.5 inch screen with resolution of 240x320 at 65,536 colors. The LCD brightness shall be a minimum of 200 lumens. The display shall have a minimum processor speed of 532 MHz.

The controller shall come standard with a 120 VAC transformer, and shall have sufficient out capacity of 40 VA to operate 15 typical solenoids simultaneously. A typical solenoid is assumed to require approximately 400 milliamps of inrush current and approximately 200 milliamps holding current.

The transformer will come with a green, black, and white wire to be hardwired in by a certified electrician.

The controller shall require a 115 volt AC power source with a minimum of a 5 amp breaker.

The controller shall maintain a below 30 VAC RMS output on the two-wire.

The controller shall be able to support up to a 1.45 amp output current.

The controller shall come standard with a USB compatible flash drive for backing up the system.

The controller shall require no battery. The use of a “super capacitor” shall replace the battery.

The controller shall come with two mini-serial port connections for use with the central software and other external devices.

The controller shall have three levels of surge protection built into the controller including a replaceable and fusible surge protection PC board.

The controller shall have a minimum of a 1 picosecond surge response time.

The controller shall have three normally closed sensor ports (switch type) to pause irrigation. The controller will suspend automatic watering if an attached sensor is open.

The controller shall support up to three other pause devices over two-wire that will suspend water for a preset time schedule if triggered.

The controller shall be manufactured with the ability to add external modules for remote activation, which allow for valve activation from a hand held remote.

Controllers shall be manufactured by Baseline Inc, in Meridian, Idaho model BL-3200-XS-R12 for 1625 Massachusetts Avenue and BL-3200-XS-R24 for Cary Memorial Library installed per manufacturer’s specifications, and as specified herein. Each controller shall be equipped with a cellular modem, Baseline model BL-CLOUD-LTE-AT-X.

DECODERS

Decoders shall be installed between the central controller and the electric control valves to provide the 24-volt power supply for individual valves. Each decoder shall be available in 1, 2 or 4-station devices. Decoder shall have a unique serial number and controller-assigned address to identify it in the network.

Decoder shall be manufactured by Baseline, model biLine or approved equal.

SOIL MOISTURE SENSORS

Soil moisture sensors shall provide the following:
Measures soil moisture using patented modified TDT technology.
Sensor is self-calibrating for all soil types and conditions.
Moisture range measurement from 5% moisture to fully saturated soil (45%).
Measures soil temperature.
Moisture readings are consistent in salty conditions.
Sensor shall be completely sealed and shall be resistant to power surges, shock, freezing, heat, salts and fertilizers.
Sensor shall have the following accuracy and repeatability:
Range: 5% to 45% volumetric (fully saturated).

Raw Sensor Resolution: 0.01% volumetric.
Volumetric Moisture Accuracy: +/- 0.1%.
Volumetric Calibration: +/- 2% of calibrated sample.
Soil Temperature: +/- 2C/3.6F.
Sensor shall be 24 to 28 VAC.
Sensor shall be manufactured by Baseline, Model bi-Sensor or approve equal.

AUTOMATIC RAIN SENSOR

Rain sensor shall be plastic in construction with adjustable interruption point, 1/2-inch IPS threads. Rain sensor shall be wireless and shall be supplied with a battery with a minimum life of 5 years. Rain sensor shall be manufactured by Hunter Industries, Rain Bird or approved equal, compatible with control system.

FLOW SENSOR

An irrigation main line flow sensor shall be provided and installed in accordance with drawings at each irrigation point of water service. Refer to drawings and/or details for location. Contractor shall be responsible for installation, hook-ups, materials, components, and connection of flow sensors to pulse decoders for complete automatic operation of the system.

For the irrigation point of connection at 1625 Massachusetts Avenue, flow sensor shall be plastic with a built-in two-wire decoder and pre-configured K and offset values. Flow sensor shall be as manufactured by Baseline, Model PFS, size 1-inch for flows between 0.90 and 50 gpm. For the irrigation point of connection at the Cary Library, flow sensor shall be manufactured of brass, with built-in two-wire decoder and pre-configured K and offset values. Flow sensor shall be as manufactured by Baseline, Model BFM, size 1-inch for flows between 0.5 and 20 gpm.

WIRE

In ground wire connections shall be UL listed, manufactured by 3M, model DBR/Y-6 splice kits. All wire splices shall be made in valve boxes, electrical junction boxes, at the controller or at valves.

All valve control wire between controller and decoders shall be polyethylene double-jacketed or UF-B UL PVC double-jacketed two-conductor solid copper designed for direct burial systems. Wire connections shall be DBR/Y-6 or equivalent. All connections shall be installed as per their manufacturers' instructions. Wire shall be manufactured by Paige Electric (maxi wire) or approved equal. Wire gauge shall be AWG #14.

All valve control wire from the decoder to the valve shall be minimum #14-awg, common #14-awg, single strand, solid copper; UL- approved direct burial AWG-U.F. 600V and shall meet all state and local codes for this service. Individual wires must be used for each zone valve. Common wire shall be white in color, and control wire shall be red in color. White color shall be used for common wire only.

Wire type and method of installation shall be in accordance with local codes for NEC Class II circuits of 30-volt A.C. or less.

All wiring shall be in strict accordance with all national, state and local electrical codes.

SURGE ARRESTORS

The modular surge arrester shall be a single phase, two pole arrester designed to protect single or split phase 120 volt or 120/240 volt electrical systems. Electrical connections shall be embedded in a UL recognized epoxy to seal and protect them from moisture and corrosion.

The surge arrestor shall be molded from weather and UV resistant polycarbonate, complying with the UL Standard for flame and strength resistance.

Surge Arrestor for controller shall be manufactured by Intermatic model, AG2401C, or approved equal. Surge Arrestor in the field, installed on the 2-wire path shall be as manufactured by Rain Bird, model LSP-1 or equal.

GROUNDING EQUIPMENT – TWO-WIRE PATH

Two-wire communication path shall be grounded at 600 foot maximum intervals and at every termination of a part of the wire path to a surge arrestor decoder. Any branch exceeding 50 feet requires a lightning surge arrestor and grounding (SEE PLAN). Each surge decoder shall be connected to a 5/8-inch diameter x 8-foot long copper clad grounding rod with minimum #6 AWG, solid, bare copper wire as outlined below. Minimum 10-foot separation between rod and other equipment. All connections to rods shall be with fusion bonded weld connectors as specified. Each grounding rod is to be covered by a 4-inch round, grated top, plastic valve cover with metal detection and six inches of 4-inch perforated drainage pipe. Ground rods shall be UL listed.

Grounding plate, 4-inch x 96-inch x 0.0625-inch copper grounding plate, shall be installed at a 36-inch depth with 50 lbs. of ground enhancement material, non-migrating material, or approved equal ground enhancement material spread evenly below the plate and evenly above the plate, two (2) 50 pound bags required. The grounding electrode shall be installed at least 10 feet from wires connected to the surge arrestor and 20ft. from the grounding plate.

Each surge arrestor shall have a separate ground.

Ground rods and plates shall be UL listed.

GROUNDING EQUIPMENT - CONTROLLER

Controller installed inside building mechanical room shall be installed with a grounding strap connected to the metal water pipe.

Ground strap shall be 1-inch wide by 0.015 inch thick with punched holes. Length and hole sizes shall be to NEC requirements.

Ground strap shall be as manufactured by ABL Electronic Supplies Inc., model GS-8 or approved equal.

CABLE FUSE SWITCH DEVICE

Cable fuse switch (DCFD) to isolate cable paths shall be installed where shown on the drawings. Cable fuse switch device shall be capable of connecting and disconnecting cable paths with the removal of a 20-amp mini automotive fuse. Voltage can be measured by connecting the probes of a meter to red/black posts. Current flow shall be measurable when a fuse is removed and the probes of an in line amp meter are connected to the posts on each side of the empty fuse holder. Device shall be in a waterproof capsule. Access to fuses shall be by unscrewing the cap. Wire leads shall be #14 AWG, type UF/TWU direct burial, 36 inches long.

Cable fuse switch device shall be as manufactured by Paige Electric, model 270DCFD/270DCFD3 or approved equal. Model shall be as indicated on the drawings.

QUICK COUPLING VALVES

Valve body shall be of cast brass construction with a working pressure of 125 psi. The valve seat disc plunger body shall be spring loaded so that the valve is normally closed under conditions when the key is not inserted.

Top of the valve body receiving the key shall be equipped with ACME threads and smooth face to allow the key to open and close the valve slowly. The quick coupling valve shall be equipped with a vinyl cover and anti-rotation wing.

Valve body construction shall be such that the coupler seal washer may be removed from the top for cleaning or replacement without disassembling any other parts of the valve.

Keys shall be ACME with 1-inch male thread and 3/4-inch female thread at the top.

Quick coupling valves, keys and swivels shall be manufactured by Hunter Industries, Rain Bird, Toro or approved equal.

ISOLATION VALVES

Isolation valves shall be gate type, of bronze construction, US Manufacture, 200 WOG with steel cross handle and 200 psi rating. Gate valves to be as manufactured by Apollo, model 102T, Hammond, Nibco, model T-113-K, or approved equal.

IN-LINE DRIP TUBING

In-line emitters in drip tubing for trees and planting beds shall be 0.60 gallon per hour on pre-installed 12-inch spacing within tube for all planting beds and 0.90 gallon per hour on pre-installed 12-inch spacing within tube for all perforated piping and tree rings. In-line drip tubing to be as manufactured by Netafim Irrigation, Model TLCV-6-12/TLCV-9-12 or approved equal. Start pressure shall be minimum 45 psi.

DRIPLINE FITTINGS

Fittings for in-line drip tubing shall be constructed of molded brown plastic having a (I.D) of 0.57 inches. Female and male threaded ends shall be capable of mating to standard pipe threads with tapered threads. In-line drip tubing fittings shall be as manufactured by Netafim, TL Series or approved equal. Stainless steel clamps shall be used to secure in-line drip tubing to all insert barbed fittings. Nominal size shall be 13/16 inches, Part No. 210. Clamps shall be constructed of 304-grade stainless steel. Interior clamp wall shall be smooth to prevent crimping or pinching of tubing. Wall thickness of clamps shall be 0.236 inches with an overall bandwidth of 1/4-inch. Properly secured clamps shall be capable of withstanding a maximum operating pressure of 441 psi. Clamps shall be one "ear" type. Clamps shall be as manufactured by Oetiker or approved equal.

Tubing stakes shall be corrosion resistant steel to secure tubing.

DEEP DRIP STAKE ASSEMBLIES

The Deep Drip Stake shall be constructed of PVC material. The stake shall have an outside diameter of 1¼” for all models. The cap material shall be made of ABS and the combination of stake tube and cap shall be able to withstand multiple strikes from a 3 lb. sledge hammer for the purpose of installing. Drip stake length shall be determined by the depth of the root ball of the tree. Stake shall be 100% contained within the root ball, while being installed to approximately 75% of the root ball depth, with the top of the stake installed even with the top of the root ball. Drip stakes shall be 24.5 inch, and cut to final length if necessary. Any field cutting of the stake shall be square.

Deep Drip Stakes shall incorporate a screen filter within the unit to eliminate debris from entering the internal area of the stake. Deep Drip Stakes shall be designed so as to permit twisting of stakes after installation to dislodge root intrusion.

The stake cap shall have an opening to accommodate 1/8” to ¼” diameter drip or low volume distribution tubing. The internal stake tube dimensions shall be able to house a fixed or variable low volume emitter. Tubing shall connect to blank drip tubing for water supply.

Connection to drip tubing shall be through a self-piercing barbed coupling. Flexible distribution tubing shall be by Rain Bird, model XQ Series ¼-inch Distribution Tubing or approved equal. Barbed connection to connect distribution tubing to drip tubing shall be of the same manufacturer as the distribution tubing. Distribution tubing to barbed fitting shall utilize a stainless-steel ear clamp (Oetiker or equal) to secure the connection.

Stakes shall have a 2 GPH pressure compensating emitter installed in the stake. Emitter shall be as manufactured by Rain Bird, Netafim or equal.

Drip stake assemblies shall be manufactured by Underhill, Green King or equal.

DISC FILTER

Filters at each drip zone shall be a plastic filter consisting of a two-piece threaded reinforced polyamide housing with EPDM rubber O-ring seal. Filter shall utilize thermoplastic, corrosion resistant polypropylene stacked discs. Clamps shall be stainless steel. The filter screen shall be 140-mesh size (black discs). Filters shall be sized to mid-range flow and not exceed 2.5-PSI pressure loss.

Filter shall be as manufactured by Hunter Industries, Netafim, Rain Bird or approved equal.

PRESSURE REGULATORS

Regulator shall have a maximum operating pressure of 45 psi for each zone. Discharge pressure shall not be less than 45-PSI. Manifold regulators to match flow rate to mid-range flow of regulator.

The pressure regulator shall be as manufactured by Hunter Industries, Netafim, Rain Bird or approved equal.

FLUSHING VALVE

The drip zone manual flush valve shall be manufactured of UV and chemical resistance molded plastic and shall accept hose/tubing with an inside diameter of 0.56”-0.60”. The valve shall be a manual 17mm ball valve Model TLSOV as manufactured by Netafim USA, Fresno, Ca or approved equal.

IDENTIFICATION TAGS

Valves shall have ID tags attached. ID tags shall be manufactured from Polyurethane Behr Desopan. Provide one tag for each electric valve. Use one tag for electric control valve. Each tag shall provide valve and station ID information.

NORMALLY CLOSED MASTER VALVE

Master control valve shall be 1-inch in size. Valve shall provide dirty water protection and no minimum flow feature.

Valve shall come with two-piece upper diaphragm and lower seat assembly. Valve shall operate within a pressure range of 20psi-200psi and have an in-rush current of 0.45amps and a holding current of 0.30 amps at 24VAC.

Valve shall be designed with removable filter and metering rod assembly and non-continuous flow through the solenoid. Rubber parts shall be EPDM rubber parts.

Normally closed master valves shall be manufactured by Rain Bird, Hunter, Toro or approved equal.

PERFORATED AERATION/DRAINAGE PIPE

Pipe used for soil aeration and irrigation distribution under paved areas shall be made of high-density polyethylene (HDPE). Pipe shall be corrugated, perforated and single wall.

All aeration/distribution pipes shall be installed in a protective sock manufactured of 100% knitted polyester.

Pipe joints shall be soil tight and utilize snap couplers.

Pipe shall conform to specifications AASHTO M-252, AASHTO M-292, ASTM F404 and ASTM F606.

Pipe shall be manufactured by ADS or approved equal.

CRUSHED STONE

1/2-inch crushed stone shall be washed at the source facility to remove fine-grained soils and shall be well graded within the following limits:

Sieve Size (ASTM D422)	Percent Passing by Weight
3/4 inch	100
½ inch	90-100
3/8 inch	0-20
No. 4	0-5

SAND

Shall consist of well-graded natural sand, free from organic, other weak or compressible materials, or frozen materials, conforming to the following gradation:

Sieve No.	Percent Passing by Weight
#8	100
#50	15-40
#100	2-10
#200	0-5

SPARE PARTS

Supply the following tools and equipment to the Owner’s Representative before final observation:

1. Two (2) quick coupler key assemblies.
2. 100 feet of drip tubing and 4 of every fitting used for drip tubing.
3. Six (6) 2.0 gpm emitters for drip stakes.

Before final observation can occur, written evidence that the Owner’s Representative has received the tools and equipment must be shown.

CONSTRUCTION METHODS

GENERAL

Before work is commenced, hold a conference with the Engineer to discuss general details of the work.

Verify dimensions and grades at job site before work is commenced. Do not proceed with installation of the irrigation system when it is apparent that obstructions or grade differences exist. Such obstructions, conflicts, or discrepancies shall be brought to the attention of the Engineer.

Make field measurements necessary for the work noting the relationship of the irrigation work to the other trades. Coordinate with other trades (landscaping and other site work trades).

Location of irrigation equipment is contingent upon and subject to integration with other utilities. Employ data contained in the Contract Documents and verify this information at the construction site to confirm the manner by which it relates to the installation.

Coordinate installation of materials, including pipe, to avoid conflict with the trees or other plantings.

During progress of work, a competent superintendent and assistants necessary shall be on site satisfactory to the Engineer. Superintendent shall not be changed, except with the consent of the Engineer, unless that person proves unsatisfactory and ceases to be employed.

Protect existing irrigation, landscaping, paving/pavers, structures, walls, footings, etc. from damage. Any inadvertent damage to the work of another trade shall be reported at once.

Replace, or repair to the satisfaction of the Engineer, existing paving/pavers disturbed during course of work. New paving/pavers shall be the same type, strength, texture, finish, and be equal in every way to removed paving.

PIPE AND FITTINGS INSTALLATION

Using proper equipment, excavate a straight (vertical) and true trench to a depth of 2-inch of pipe invert elevation.

Loam or topsoil encountered within the limits of trench excavation for irrigation mains and branch lines shall be carefully removed to the lines and depths specified and stockpiled for subsequent replacement in the upper 6 inches of the trench from which it is excavated. Such removal and replacement of the quantities of loam shall be considered incidental to the irrigation system and no additional compensation will be allowed therefore.

Pipe shall be laid on undisturbed trench bottom.

Backfilling shall be accomplished as follows: the backfill material shall contain no foreign matter and no rock. Carefully place material around pipe and wire and tamp in place. Backfill shall be laid-up in 6-inch (maximum) lifts and tamped to compaction with mechanical equipment. Compact backfill in trenches to dry density equal to the adjacent soil, and conform to adjacent grades without dips, sunken area, humps, or other irregularities. Frozen material shall not be used for backfill.

Make solvent-weld joints in strict accordance with manufacturer's recommendations, making certain not to apply an excess of primer or solvent, and wiping off excess solvent from each connection. Allow welded joints at least 15 minutes set-up/curing time before moving or handling. When the temperature is above 80º F, allow connections to set minimum 24 hours before pulling or pressure is applied to the system. When temperature is below 80º F, follow manufacturer’s recommendations. Provide and install for expansion and contraction as recommended. Wire conduit shall be laid in same trench as mainline and at pipe invert (see Cable Installation).

Mainline pipe shall have minimum 20 inches of COVER (excavate to invert as required by pipe size). Lateral turf pipe shall have minimum 16 inches of COVER (excavate to invert as required by pipe size). Planting lateral pipe shall be installed on finished grade. See details.

Cut plastic pipe with handsaw or pipe-cutting tool, removing burrs at cut ends. Pipe cuts are to be square and true. Bevel cut end as required to conform to Manufacturer's specifications.

Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in the trench. At times, when installation of the pipe is not in progress, the open end(s) of the pipe shall be closed by a watertight plug or other means. Pipe which cannot temporarily be joined, shall be sealed to make as watertight as possible. This provision shall apply during the lunch hour as well as overnight. Pipe not to be installed that day shall not be laid out. Should water enter the trench during or after installation of the pipe, no additional pipe may be installed or backfilled until water is removed from the trench. Pipe shall not be installed when water is in the trench, when precipitation is occurring, or when the ambient temperature is at 40º F or below. Pipe installed at temperatures below 40º F shall be removed and replaced at no additional cost. Pipe shall be snaked in the trench to accommodate for expansion and contraction due to changes in temperature.

Tracer wire and cable conduit shall be laid in same trench and at pipe invert (see "Cable Installation"). Tracer wire shall be accessible at lateral valve boxes as indicated on the drawings.

In installing irrigation pipe route, the pipe as necessary to prevent damage to tree roots.

Pipe shall be installed such that its curvature does not exceed manufacturer’s recommendations.

Maintain 6-inch minimum clearance between irrigation lines and lines of other trades. Do not install irrigation lines directly above another line of any kind.

Maintain 1-inch minimum between lines which cross at angles of 45 to 90 degrees.

Before pressurization, pipe shall be flushed with a proper amount of water to flush dirt and debris from the pipe system so that it will not end up in the dripline. Install flush points as needed for this task at no additional cost.

Throughout the guarantee period refill any trenches that have settled due to incomplete compaction.

ELECTRICAL WIRE CONDUIT INSTALLATION

Electrical conduit shall be installed for communication cable, in non-soil areas, as well as for above ground wiring. Minimum cover shall be as indicated on the details.

Conduit shall extend 12 inches beyond edges of walls, curbs, roadways and pavement/pavers.

Following the installation of road and walk crossings, the ends of conduits shall be field located by GPS or surveyed to allow for field location at the time of irrigation installation. Location and coordinates shall be shown on record drawings.

Ensure that required conduit is installed prior to starting any pavement/paver operations or casting concrete structures which require conduit to pass through the items. Review conduit locations in the field to confirm that conduits are properly located for the required irrigation cable runs. In no case will saw cutting into newly installed pavements/pavers or jacking under new pavement/pavers be permitted to install conduit which was not installed in proper sequence or in the required orientations or locations.

PIPE SLEEVING INSTALLATION

Sleeving shall be installed wherever pipe is going under non-soil areas. Minimum cover over sleeving pipe shall be as indicated on the details.

Following the installation of sleeving, the ends of sleeving shall be field located by GPS or surveyed to allow for field location at the time of irrigation installation. Location and coordinates shall be shown on record drawings.

Ensure that required sleeving is installed prior to starting any pavement/paver operations or casting concrete structures which require sleeving to pass through the items. Review sleeve locations in the field to confirm that sleeves are properly located for the required irrigation pipe runs. In no case will saw cutting into newly installed pavements/pavers or jacking under new pavements/pavers be permitted to install sleeving which was not installed in proper sequence or in the required orientations or locations.

ISOLATION VALVE INSTALLATION

Install an isolation valve in a 10-inch round valve box on the PVC mainline, downstream of the point of connection for complete system isolation as per detail. Also install isolation valves where indicated on the drawings.

Install isolation valves on a level crushed stone base so that they can be easily opened or closed with the appropriate valve wrench. Install specified valve box over each isolation valve.

Check and tighten valve bonnet packing before valve box and backfill installation.

VALVE BOX INSTALLATION

Furnish and install a valve access box for each electric valve, isolation valve, ground plate, quick coupling valve, valve manifold, isolation valve, decoder, surge/lightning arrestor and cable splice.

Valve access boxes shall be installed on a minimum 2-inch crushed stone base. Finish elevation of boxes shall be at grade. Crushed stone to be installed before valve box. Crushed stone shall not be poured into previously installed valve boxes.

Valve boxes shall be installed neatly. Boxes shall be parallel or perpendicular to hardscape edges and equidistance to other valve boxes installed in the same location. A sufficient amount of turf shall remain in place between each valve box and between valve boxes and hardscapes.

Valve box extensions shall be provided as required on valve boxes in order to install valve box covers at grade.

Bricks, stones, etc. shall not be used to support valve boxes. Install isolation valves per detail where indicated on the drawings. Install isolation valves on a level crushed stone base so that they can be easily opened or closed with the appropriate valve wrench. Install specified valve box over each isolation valve.

Check and tighten valve bonnet packing before valve box and backfill installation.

ELECTRIC CONTROL VALVE INSTALLATION

Control valves shall be installed on a level crushed stone base. Grade of bases shall be consistent throughout the project so that finish grades fall within the limits of work. Valves shall be set plumb with adjusting handle and bolts, screws and wiring accessible through the valve box opening. Valves shall be set in a plumb position with 24-inch minimum maintenance clearance from other equipment.

Adjust zone valve operation after installation using flow control device on valve.

CABLE INSTALLATION

Cable shall be installed in conduit along with the mainline and at the same invert as the mainline pipe. Sufficient slack for expansion and contraction shall be maintained and cable shall at no point be installed tightly. Cable in valve boxes shall be a sufficient length to allow the valve solenoid, decoder, splices and connections to be brought above grade for servicing. This additional slack shall be coiled for neatness in the valve box.

Service cables in connection with local codes for low voltage service. In-ground electrical connections shall be waterproofed with 3M DBR/Y-6 splice kits or approved equal. Splices shall be made in valve boxes. No independent splices shall be allowed.

Provide a complete diagram showing cable routing for the connections between the controller, decoders and valves. See Section 1 for the inclusion of diagram in operation and maintenance manuals.

Conduit shall be laid in trenches and shall be carefully backfilled to avoid any damage to the conduit. Cable not to be installed that day shall not be laid out.

CONTROLLER INSTALLATION

Contractor shall install new controllers to replace existing controllers on interior walls of the Cary Memorial Library and 1625 Massachusetts Avenue in designated mechanical spaces. Contractor shall wire proposed two-wire communication cables, exiting control wires with common from valves and rain sensor into controller and set proper program.

Wire controller to 120-volt electrical supply by licensed electrician.

Keys shall be turned over to the Engineer.

MASTER VALVE AND FLOW SENSOR INSTALLATION

An irrigation master valve and flow sensing devices shall be provided and installed in accordance with the drawings and manufacturer’s requirements at each water supply point of connection, downstream of the backflow preventer. Refer to drawings for location. Contractor shall be responsible for installation, hook-ups, materials, components, and connection of device.

Valve shall be installed upstream of any branch lines serving the various exterior irrigation points of connection.

New valves shall be wired to the irrigation controller using the 2-wire circuit and programmed.

SURGE ARRESTOR INSTALLATION

Install surge arrestors within 50 feet of the end of communication paths and a maximum of 600 feet along the path where indicated on the drawings. On branches, an arrestor shall be installed within 50 feet of the branch.

GROUNDING INSTALLATION

Attach #6 solid, insulated copper wire to controller using 1-1/2-inch conduit. Route wire to 2-inch copper water pipe in 1-1/2-inch conduit and attach wire to copper grounding strap using a copper grounding split nut and bolt through ground strap holes.

When tested, grounding grid shall meet the minimum requirements of the NEC.

Two-wire communication path shall be grounded at 600-foot maximum intervals and at every termination of a part of the wire path to a surge arrestor decoder where indicated on the drawings. Any branch exceeding 50 feet requires a lightning surge arrestor and grounding.

Grounding plate, 4-inch x 96-inch x 0.0625-inch copper grounding plate, shall be installed at maximum depth with 50 lbs. of non-migrating material ground enhancement material spread evenly below the plate and another 50 lbs. spread evenly above the plate, two (2) 50-pound bags. The grounding plate shall be installed at least 10 feet from wires connected to the surge arrestor. Ground plate shall also be installed 10 feet from other wires.

Each surge arrestor shall have a separate ground.

RAIN SENSOR INSTALLATION

Install rain sensor on exterior building wall, generally where indicated on the drawings. Coordinate final location of rain sensor with Engineer. Rain sensor shall be in direct contact with the weather. Rain sensor shall be installed in a location so as not to be obstructed from the prevailing wind and so that the freeze sensor points South.

Install two (2) #14 solid copper wires in polyethylene jacket UF approved from controller to weather sensor. Install rain sensor wiring within 1/2-inch conduit where exposed. All above ground wires shall be installed in conduits.

Distance from controller to weather sensor shall not exceed 200 feet.

DEEP DRIP STAKE INSTALLATION

Drip stakes to be installed four per tree as shown on the details. Stakes shall have 2 gph emitters installed in the stake. Place tree watering stakes generally as indicated on the drawing and details. Tree stakes shall be placed near the edge of the root ball as per the installation details. Install stake as per the manufacturer’s recommendations, to a depth where the top of the cap is flush with finish grade.

¼-inch distribution tubing shall be installed from the blank drip tubing ring and 12 inches into the tree stakes. Connection of the ¼-inch distribution tubing to the barbed connection at the drip ring shall be clamped using a suitable stainless steel ear-clamp.

Emitter shall be installed on end of distribution tubing placed within the deep drip stake.

DRIP PRESSURE REGULATOR

Pressure regulator shall assure a 45-PSI downstream pressure entering drip supply header. Pressure shall be verified to assure proper operating pressure for the emitters. Pressure regulators may need to be manifolded to reach the mid-range flow of the regulator.

FLUSH VALVE INSTALLATION

Flush valves shall be installed minimum one per tree zone at the low point on the zone, above grade. See detail.

QUICK COUPLING VALVE INSTALLATION

Provide and install quick coupling valves where indicated on the drawings.

Quick coupling valves to be mounted on 1-inch prefabricated PVC unitized swing joint assemblies with integral O-rings, minimum length 12 inches with brass insert and stabilizer.

CHECK/TEST/START-UP/ADJUST

Flushing:

A. After pipe, valves, pipelines and risers are in place and connected, but prior to installation of sprinklers and emitters, open the control valves and flush out the system under a full head of water.

B. Emitters and sprinkler nozzles shall be installed only after flushing of the system has been accomplished to the full satisfaction of the Engineer.

C. Contractor shall be responsible for flushing the entire system after installation is complete and will be responsible for any clogged equipment for thirty (30) days after substantial completion of the irrigation system.

Testing:

A. Leakage test: test lines for leaks under operating pressure. Repair leaks and re-test.

B. Coverage test: perform a coverage test in the presence of the Engineer (notify Engineer at least seven (7) days in advance of scheduled coverage test). Representative will determine if the water coverage is complete and adequate.

CLEANING AND ADJUSTING

At the completion of the work, parts of the installation shall be thoroughly cleaned. Equipment, pipe, valves and fittings shall be cleaned of grease, metal cuttings and sludge which may have accumulated by the operation of the system for testing.

Adjust valve boxes and quick coupling valves to grade as required, so that they will not be damaged by maintenance operations.

Continue coverage adjustment as required by settlement, etc., throughout the guarantee period.

Each control zone shall be operated for a minimum of 5 minutes and emitters checked for consistency of delivering water. Adjustments shall be made to equipment that is not consistent to the point that they match the manufacturer's standards. Emitters, valves, timing devices or other mechanical or electrical components, which fail to meet these standards, shall be rejected, replaced and tested until they meet the manufacturer's standards.

ACCEPTANCE AND OPERATION BY ENGINEER

Upon completion of the work and acceptance by the Engineer, train the Town of Lexington’s personnel in the operation of the system (provide minimum 7-day written notice in advance of test). Furnish, in addition to the Record Drawings and operational manuals, copies of available specification sheets and catalog sheets to the Town of Lexington’s personnel responsible for the operation of the irrigation system. Guarantee parts and labor for a minimum period of one (1) year from date of acceptance.

CLEAN UP

Upon completion of installation work, remove leftover materials and equipment from the site in a safe and legal manner.

Remove debris resulting from work of this section.

Regrade, lightly compact, and replant where necessary to maintain proper vertical positioning in relation to established grade.

Fill depressions and eroded channels with sufficient soil mix to adjust grade to ensure proper drainage. Compact lightly, and replant filled areas.

METHOD OF MEASUREMENT

Item 390.3, Irrigation System will be measured for payment as a lump sum installed complete in place and fully tested and operational as determined by the Engineer.

BASIS OF PAYMENT

Item 390.3, Irrigation System, will be paid for at the contract unit price per lump sum in percentage of the work completed as approved by the Engineer. The unit price shall include full compensation for labor, tools, equipment, materials, transportation and incidental costs required to complete the work to the satisfaction of the Engineer.

This price will include all excavation, backfill materials, pipe, valves, grate, cover, sleeving, enclosures, testing, inspection fees and incidentals for complete system installation.

ITEM 415.2 PAVEMENT FINE MILLING SQUARE YARD

Work under this Item shall conform to the relevant provisions of Subsection 415 and consist of the removing by machine of HMA pavement from the roadway, as depicted on the plans or as directed by the Engineer.

The machine shall be capable of being operated at speeds from 18 to 40 feet per minute and designed so that the operator can at all times observe the operations without leaving his control area. A cut to predetermined grade or any specified lesser depth up to 3” may be required in one pass. The machine shall be adjustable as to crown and depth.

No asphalt cuttings shall remain at the project site at the end of each day. All surplus materials resulting from milling shall remain the property of the Contractor and, shall be removed by the Contractor and legally disposed of in an acceptable manner and in accordance with all local and state codes.

Milled surfaces shall be squared off and vertically transitioned for the full width of the pavement width at the end of each day. The Contractor shall plan his milling and overlay operations such as to meet the finish pavement grades shown on the plan. Milling shall be varied to the extent practical in order to meet these grades with the proposed overlay.

Payment under this Item shall be at the Contract Unit Price per square yard up to a depth of 3 inches, regardless of depth or the number of vertical adjustments required. Any additional hand work or jack-hammering needed to remove bituminous or cement concrete from around structures shall be included under this Item with no additional compensation. If necessary, adjustment of structures shall be considered incidental to this item.

ITEM 460.23	**SUPERPAVE SURFACE COURSE – 12.5 (SSC – 12.5)**	**TON**
ITEM 460.31	**SUPERPAVE INTERMEDIATE COURSE – 12.5 (SIC – 12.5)**	**TON**
ITEM 460.42	**SUPERPAVE BASE COURSE - 37.5 (SBC - 37.5)**	**TON**
ITEM 460.53	**SUPERPAVE LEVELING COURSE – 12.5 (SLC - 12.5)**	**TON**
ITEM 451.	**HMA FOR PATCHING**	**TON**
ITEM 452.	**ASPHALT EMULSION FOR TACK COAT**	**GALLON**
ITEM 453.	**HMA JOINT SEALANT**	**FOOT**

DESCRIPTION

Work under these items (including incidentals for Asphalt Emulsion for Tack Coat and/or Joint Sealant) shall conform to the relevant provisions Section 460 and the following:

The PGAB Grade selected for this Contract is **PG 64-28**. The emulsion under this specification shall be Grade RS-1H and shall meet the requirements of AASHTO M 140.

All required sawcutting in the existing pavement in accordance with Sections 450 and 455 will be included in the contract unit price for each superpave pavement course, including sawcutting asphalt pavement for box widening.

Tack coat and sand shall be applied to all joints composed of bituminous concrete immediately after paving or as directed by the Engineer.

It should be noted that roads could require several lifts of leveling material in order to eliminate water problems in low spots prior to placing the top course of bituminous concrete.

MEASUREMENT AND PAYMENT

Tonnage shall be determined by weight slips submitted to the Engineer. Also, this number will be verified by the inch per square yard method of determining tonnage (inches of approved thickness, multiplied by square yard unit measurement, multiplied by the volume to weight conversion factor of 0.056 tons/inch/square yard).

Payment under this Item shall be at the Contract Unit Price bid per Ton, complete in place; which price shall be considered full compensation for all labor, equipment, materials, and incidentals, including tack coat, as necessary to complete the work to the satisfaction of the Engineer. This price shall also include all necessary work to prepare the pavement surface, including street sweeping, as well as any requirements as listed in Section 460 contained herein that are not covered under other specified payment items.

Price adjustments for hot mix asphalt (all asphalt items under section 460) will be made in accordance with Document 00811 published by MassDOT revised July 8, 2016. Asphalt adjustment shall be documented on each invoice with no adjustment shown on invoice one. Invoice two will include the adjusted asphalt cost from the invoice one tonnage and so on. The contractor shall provide documentation and calculations demonstrating the proper adjustment. The base bid for liquid asphalt on this contract shall be the period price at the date of the bid opening as published by MassDOT on its website.

ITEM 472. TEMPORARY ASPHALT PATCHING TON

Work under this Item shall conform to the relevant provisions of the Standard Specifications, the Material Specification for Item 460 and the following:

Work will include temporary trench repair in areas to be milled and overlaid (where not otherwise included under other items), miscellaneous patching, utility trench patching and other uses as may be directed by the Engineer. Hot mix asphalt for miscellaneous work shall also be used to provide temporary access and egress to properties abutting the work area, as determined by the Engineer. The Contractor is advised that this is material which will be spread primarily by hand.

No additional compensation will be made for cutting existing pavement in order to provide a clean match line. No payment will be made for roadway patching done outside the excavation pay limits as detailed on the plans. The subsequent removal of this material, if directed by the Engineer, shall also be included in this Item.

Hot Mix Asphalt for temporary work shall be placed only upon the direction of the Engineer.

Tonnage shall be determined by weight slips submitted to the Engineer. Where weight slips are unavailable, the inch per square yard method shall determine tonnage (inches of approved thickness, multiplied by square yard unit measurement, multiplied by the volume to weight conversion factor of 0.056 tons/inch/square yard). This calculation method shall also be used to confirm tonnage used.

Compensation for this Item shall be at the Contract Unit Price per Ton, which price shall include all labor, materials, equipment for surface preparation, placement, maintenance and removal, and incidental costs necessary to complete the work to the satisfaction of the Engineer.

The Contractor shall be required to maintain areas of temporary pavement in reasonable repair, as determined by the Engineer, and not be compensated for additional materials, labor and incidentals required to do so.

ITEM 504.01 GRANITE CURB TYPE VA-4 FOOT

Work under these Items shall conform to the relevant provisions of Section 500, supplemented and amended as follows:

Work under Item 504 shall include furnishing and installing Type VA-4 curb, including straight or curved sections, splayed or transition pieces for wheelchair ramps, curb corners, and curb inlets with measurement made on a linear foot basis measures along the centerline axis of the curb piece. Six foot pieces shall be used at curb inlets.

Curb transitions shall be of the same type and similarity as the abutting curb. The ends of the transition curb shall be cut so that a flush, neat joint is formed where the transition curb meets the existing or proposed curbing. No additional payment will be made for customizing curb material to affect the transition.

Curb inlets shall be installed at catch basins at locations shown on the plan and at the direction of the Engineer.

All granite curbing shall be provided with concrete support, as shown on the construction detail. Concrete support shall be provide on both sides of curbing that does not have a hard surface backing it up, such as in non-sidewalk areas. Cost of concrete support shall be included in the price bid for curb.

All Granite curb to be adjacent to brick pavers shall be provided with a “neat” sawn inside face, four inches from the top to allow for a neat line between the curb and paver units. Curb ends for the proposed tree well shall be mitered, as detailed on the plans.

Payment under these Items shall be at the Contract Unit Prices bid per Foot for furnishing and installing granite curb with sawn inside face where required, complete in place including excavation, gravel borrow, compaction, concrete supports, cutting and all other work to compete the installation of curb to the satisfaction of the Engineer.

ITEM 520.13 SLOPED CONCRETE CURB FOOT

Work under this Item shall conform to the relevant provisions of Section 500, supplemented and amended as follows:

Work under Item 520.13 shall include furnishing and installing precast sloped concrete curb to replace as necessary the existing precast concrete curb at the back of sidewalk in front of #1822 and #1840 Massachusetts Avenue. The Contractor shall match existing curbing by shape, color, and material, and blend into the curb that is to remain.

Existing concrete curbing to be removed shall be paid under Item 120.1 Unclassified Excavation.

Payment under these Item shall be at the Contract Unit Prices bid per Foot for furnishing and installing sloped concrete curb, complete in place including excavation, gravel borrow, compaction, cutting and all other work to compete the installation of curb to the satisfaction of the Engineer

ITEM 580. CURB REMOVED AND RESET FOOT

This work under this Item shall consist of removing and resetting all forms of granite curb and edging on the project. Work shall be in accordance with these specifications and as directed by the Engineer.

Excessively chipped or broken curbs will not be reused. The Engineer will determine which curbs shall be reused. The Contractor shall be required to arrange and match like curb pieces being reset so that there is a consistent appearance to the curbing, to the degree possible.

All granite curb to be reset and adjacent to proposed paver border shall be provided with a sawn inside face, four inches from the top to allow for a neat line between the curb and paver units.

Existing curb or edging if not reset or stacked, regardless of size, material, or piece shall be removed and discarded, if not wanted by the Town. Removing and Discarding Curb or Edging will be compensated under Item 120.1, Unclassified Excavation.

All granite curbing to be removed and reset shall have concrete support, as shown on the construction detail and as per the MassDOT’s Standard Drawing No. 106.3.0. Concrete support shall be provide on both sides of curbing that does not have a hard surface backing it up, such as in non-sidewalk areas. Cost of concrete support shall be considered incidental to this Item.

ITEM 580.2 SAND BLAST EXISTING CURB FOOT

Existing curb to remain or to be removed and reset or as directed by the Engineer, shall be sand blasted. The existing paint marks and other discoloration of curb shall be removed under this item.

Sand for sand blasting shall consist of clean, hard durable grains of quartz, free from loam or any foreign substance and shall meet the following gradation:

Sieve No.	% Passing
16	100% max.
20	15 max.
30	3 max.
40	Trace

The quartz content shall be a minimum of 95 percent. The sand shall have a minimum hardness of seven as measured by the Moh scale.

Sand blasting shall be performed after roadway gravel base course has been placed but before bituminous pavements or sidewalk bricks are placed, in areas of roadway reconstruction prior to laying the overlay in areas of resurfacing.

Granite curb shall receive a medium sand blast treatment. Medium treatment is intended to mean that all paint, dirt and skin layers shall be removed to provide exposed surfaces of existing curb to similar conformity with new granite curb.

All adjacent areas shall be protected, by covering or other means, from damage as a result of sand blasting. Any damaged areas shall be replaced to the satisfaction of the Engineer at the Contractor's expense.

Sandblasting will be paid under the contract unit price per Foot including all labor, tools, equipment and materials required to complete the work to the satisfaction of the Engineer.

REMOVE AND RESET
ITEM 598.1 GRANITE CURB FOR PLANTERS FOOT

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include removing 4-inch and 6-inch wide granite curb for tree planters, cleaning, trimming , and resetting as shown on the drawings and as directed by the Engineer. Design intent is for a restoration of the streetscape on the north side of Mass Avenue, between Meriam Street and Edison Way. All granite curbing for shrub and tree planters in this area (except for Granite Curbing for Bench Planters) shall be removed and reset as shown on the drawings. Granite curbing shall be similar in appearance of age, finish and color and utilize existing planter curbing or used granite curbing specified in item 598.2.

Granite curbing shall be 4-inch top width only. The stone shall be sound, durable, and free from seams that may impair the structural integrity; they shall be straight lined. Any piece of curbing showing flaws or imperfections upon removal at the jobsite shall be immediately referred to the Engineer for a determination of suitability for reuse or rejection. Rejected pieces shall be removed and legally disposed of. Existing granite curbing with a 6-inch top width shall be field cut to allow for a 4-inch top and width to accommodate the brick pavers and sand setting bed. Existing granite curbing to be reset above the Modular Soil Cells will need to be sawn to the depth shown on the drawings.

The minimum length of stones shall be 4’-8” for the 5’x5’ tree planter and 3 feet for all other uses.

METHOD OF CONSTRUCTION

Refer to Item 598.2 for Method of Construction. Contractor shall remove and stack usable granite intended for re-use for approval by Engineer. Cut to size granite curbing material shall be approved by Engineer before installation.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Remove & Reset Granite Curb Planters will be paid for at the contract unit price per Linear Foot, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required removing, cleaning, trimming, cutting or splitting to size, excavation, foundations, backfill, crushed stone, fasteners, and mortar or non-shrink grout, required to complete the work to the satisfaction of the Engineer.

Gravel borrow will be paid for at the contract unit price per cubic yard under Item 151.

ITEM 598.2 GRANITE CURB FOR TREE AND SHRUB PLANTERS FOOT

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include the installation of new or used granite curbing for landscape uses and the provision of necessary anchors, as shown on the plan or as directed by the Engineer. Granite Curb shall be used at tree planters, shrub planters, and at bench planters. All granite curbing for shrub and tree planters on the north side of Mass Avenue, between Meriam Street and Edison Way (with the exception of Granite Curbing for Bench Planters) shall be similar in appearance of age, finish and color and utilize existing planter curbing in Item 598.1or used granite curbing in this Item.

SUBMITTALS

The Contractor shall supply material samples of the new and used granite for color and finish and provide a detailed shop drawing showing sections and profiles highlighting dimensions, jointing, anchors and finishes for approval of the Engineer prior to ordering or fabricating of granite. Show necessary hardware required for anchors.

DELIVERY, STORAGE & HANDLING

Any piece of Landscape Curbing showing flaws or imperfections upon receipt at the jobsite shall be immediately referred to the Engineer for a determination on responsibility, suitability for reuse or rejection.

If rejected the Contractor shall take charge and replace the stone pieces identified at no charge. Back charges to the supplier shall be made only with prior notification.

Landscape curb supplied under this specification shall be adequately protected from damage during storage.

MATERIALS

Curbing shall conform to the dimensional requirements shown in the drawings. All stone shall be sound, durable, and free from seams that may impair the structural integrity; they shall be straight lined, without wind, and free from bunches or depressions. Granite curbing material shall be approved by Engineer before installation.

Used curbing: Top width of granite shall be 4-inches. Granite shall match existing granite planter curbing in finish and color.,
Used curbing may be supplied by:
Olde New England Granite
One New Salem Street
Wakefield, MA 01880
781-334-4805

Attn: Bryan Shea, cell- 781-570-1356

New curbing shall be medium grained gray and conform to Standard Specifications M9.04.1 for VA-4 Vertical Granite and ASTM C615 and shall not be taken from the surface of the quarry.

The top of new stone shall be sawed to an approximately true plane, with no projections or depressions greater than 1/4-inch in any one piece. The front and back arris lines shall be pitched straight and true. There shall be no projections on abutting back or the end faces greater than 1/4 inch.

The front face shall be at right angles to the plane of the top and shall be smooth quarry split, free from visible drill holes. No projections greater than 1/4-inch or depressions greater than 1/4-inch measured from the vertical plane of the face through the top arris line for a distance of 9-inches down from the top. The minimum length of stones shall be 4'-8" for the 5'x5' tree planter and 3 feet for all other uses.

Mortar: Mortar shall comply with M 4.02.15 of the MassDOT Standard Specifications.

Caulking: Caulking shall comply with M 9.14.4 of the MassDOT Standard Specifications.

Dowel bars shall be stainless steel conforming to MassDOT Standard Specifications.

METHOD OF CONSTRUCTION

Excavation shall be made to a sufficient depth to allow for a gravel base course. All soft and unsuitable material shall be removed and replaced with approved granular material which shall be thoroughly compacted. Install gravel and compact to 95% density.

The gravel base upon which the curb is to be set shall be compacted to a firm, even surface.

Granite Curb over Modular Soil Cells will not have a gravel base and will be installed on the concrete base for Brick Pavers Item 706.01

Clean stone before setting by scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives.

Set granite in accordance with Contract Drawings and final Shop Drawings. Provide dowels, anchors, supports, and other attachments shown, specified or necessary to secure stonework in place in accordance with the best practices of the trade. Butt end-to-end as close as possible, 3/8 inch maximum. All the joints of the curbing shall be field cut with care and rebutted for even fitment and appearance. Shim and adjust accessories as required for proper setting of stone.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Granite Curb for Landscape Uses will be paid for at the contract unit price per Linear Foot, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required furnishing, transporting, excavation, foundations, backfill, crushed stone, anchors, and mortar or non-shrink grout, required to complete the work to the satisfaction of the Engineer.

Gravel borrow will be paid for at the contract unit price per cubic yard under Item 151.

ITEM 598.5 GRANITE BLOCK FOOT

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include manufacture and installation of the granite block for Bench Planters A-G and providing necessary anchors, as shown on the plan or as directed by the Engineer.

QUALIFICATIONS

The Contractor shall submit written qualifications of the Contractor providing the granite cutting, finishing and installation.

SUBMITTALS

The Contractor shall provide a detailed shop drawing for each Bench Planter showing sections and profiles highlighting layout, dimensions, jointing, and finishing for approval of the Engineer prior to ordering or fabricating of granite block. Show necessary hardware required for fastening.

Before proceeding with the installation of the granite block, the Contractor shall submit to the Engineer for approval, samples of the granite showing the color range and texture/finish. Submit manufacturer’s literature for joint filling materials, non-shrink grout and anchors, ties and accessories.

Contractor shall provide at least three (3) 4” x 4” samples of granite block showing color and finish.

MATERIALS

Granite shall conform to the requirements of ASTM C615 for Granite Dimension Stone and the following:

1. Granite shall be sound and uniform in quality, texture, and strength, and shall be free of flaws, reeds, rifts, laminations, cracks, seams, starts, or other defects that may impair its strength, durability, function, or appearance.
2. Exposed surfaces shall be free from spots, spalls, chips, stains, discoloration, or other defects that would affect its appearance.
3. Color to be selected from samples supplied by the Contractor and approved by the Town.

Size and Dimension: Granite shall be of the sizes and dimensions indicated on the plans and approved Shop Drawings.

Color and Finishes: Granite color shall match curbing supplied in Item 598.2 Granite Curb For Tree and Shrub Planters. All exposed faces shall have a Thermal finish per the plans and unexposed faces shall have a sawcut finish.

Granite shall be cut accurately to required shapes and dimensions as shown on the Shop Drawings.

Holes, cut-outs, sinkages and openings in granite work for anchors, cramps, dowels, supports, and lifting devices, shall be accurately cut or drilled to required dimensions, as shown on the approved Shop Drawings, and as necessary to secure granite in place to insure correct location and accurate fit of all fixtures.

Mortar: Mortar shall comply with M 4.02.15 of the MassDOT Standard Specifications.

Premolded expansion joint filler: Premolded expansion joint filler shall comply with ASTM D1751 of the MassDOT Standard Specifications and shall be on the MassDOT Qualified Construction Materials approved product list.

Caulking: Caulking shall comply with M 9.14.4 of the MassDOT Standard Specifications.

Dowel bars shall be stainless steel conforming to MassDOT Standard Specifications. The holes for anchor bars shall be as shown on the plans.

METHOD OF CONSTRUCTION

The Contractor shall examine the areas to receive the new granite block (Bench Planter) for compliance with the requirements for installation tolerances and other conditions, which may affect performance.

Proceed with the installation of the granite block only after unsatisfactory conditions have been corrected at the direction of and to the satisfaction of the Engineer.

The Contractor shall be responsible for timing the delivery of masonry and accessories to minimize on-site storage time prior to installation. All stored materials and items must be protected from weather, careless handling and vandalism.

Clean granite block before setting by scrubbing with fiber brushes followed by a thorough drenching with clear water. Use only mild cleaning compounds that contain no caustic or harsh fillers or abrasives.

Set granite block in accordance with Contract Drawings and final Shop Drawings. Provide dowels, anchors, supports, fasteners, and other attachments shown, specified or necessary to secure stonework in place in accordance with the best practices of the trade. Shim and adjust accessories as required for proper setting of stone.

Do not allow any petroleum-based fillers or sealants to come into contact with stonework.

Tolerances for Variation in Stonework - Variation from Plumb-Do not exceed 1/8 inch in 10 feet or more.

Variation from Level - Do not exceed 1/8 inch in 10 feet, 1/4 inch in 20 feet or 3/8 inch maximum.

Cross Slope- Slope the top of granite block 1/8 inch per foot toward exposed face of wall or down slope.

Variation in Joint Width - Do not vary joint thickness more than 1/8 inch in 36 inches or one-fourth of nominal joint width, whichever is less

Setting

1. Set accurately as shown on approved Shop Drawings
2. Alignment should be straight and true to all dimensions. It may not vary more than 1/16" in length, height or width
3. Install anchors, brackets, dowels and inserts as shown on plans
4. Fill joints between with manufacturer approved caulk sealer or as specified.

Protection

1. Upon completion, the work shall be ready for final inspection and acceptance by the owner or owner agent
2. General contractor shall protect the finished work from the time the installing contractor completes the work

Finish

1. Overall uniformity in matrix and aggregate
2. All product to be sealed with approved sealer

Adjusting and Cleaning Granite Block Pieces
Remove and replace stained and otherwise damaged granite block units and granite block not matching approved samples. Stone pieces may be repaired if methods and results are approved by the Engineer

During the progress of the work, keep the exposed surfaces of granite clean at all times and protected against damage.

Final Cleaning: Before final completion at a time approved by the Engineer, clean exposed granite as previously described.

Flatness Tolerance: Variation from true plane, or flat surfaces, shall be determined by use of a 4’ foot long straightedge, applied in any direction on the surface. Such variations on surfaces at the bed and joint arris lines shall not exceed 1/4 of the specified joint width.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT
Granite Block will be paid for at the contract unit price per Linear Foot, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required furnishing, transporting, excavation, foundations, granite block, backfill, crushed stone, fasteners, and mortar or non-shrink grout, required to complete the work to the satisfaction of the Engineer.

Gravel borrow will be paid for at the contract unit price per cubic yard under Item 151.

ITEM 598.51 WOOD SEAT AT BENCH PLANTER FOOT

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include installation of wood seat on granite block, and providing necessary materials and fittings, as shown on the plan or as directed by the Engineer.

SUBMITTALS
The Contractor shall provide a detailed shop drawing showing dimensions and finishing for the wood seat and how it is attached to the granite block, for approval of the Engineer prior to ordering or fabricating the wood seat.

Contractor shall submit 6” x 6” samples of color and finishing of wood seat assembly for approval.

MATERIALS
Wood Seat shall be Ogden Series straight sections as manufactured by Maglin Site Furniture, Woodstock, ON, Canada (1-800-716-5506), or approved equal. Typical width of bench is 1’-6”. Wood slats for bench shall be laid side to side and shall be Thermally Modified Ash and mounted on a steel pan. Mount for wall application shall be powder coated steel as supplied by the manufacturer. Skate deterrent metal Model MSD301, natural aluminum, shall be factory fit.

Provide stainless steel expansion bolt to secure bench mount to granite. Bolts shall be embedded a minimum of 3 ¾” into granite and sealed with epoxy sealer.

METHOD OF CONSTRUCTION
The Contractor shall install the wood seat and steel pan according to the plans and manufacturers recommendations.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT
Wood Seat at Bench Planter will be paid for at the contract unit price per Linear Foot, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including

all required fasteners, and mortar or non-shrink grout, required to complete the work to the satisfaction of the Engineer.

ITEM 701.	CEMENT CONCRETE SIDEWALK	SQUARE YARD
ITEM 701.1	**CEMENT CONCRETE SIDEWALK AT DRIVEWAYS**	**SQUARE YARD**
ITEM 701.2	**CEMENT CONCRETE WHEELCHAIR RAMP**	**SQUARE YARD**

The work under these Items shall conform to the relevant provisions of Section 701 of supplemental section of Town standards and these specifications and as directed by the Engineer.

The Contractor shall follow the Interim Subsection 701 under Division II of the supplemental specification for cement concrete sidewalk, driveway and wheelchair ramp installation work.
All work shall conform to the latest edition of the MassDOT and ADA Standards. The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards. The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

Sidewalks shall be constructed in accordance with requirements of the Standard Specifications, including placement of alternating sections, 30 feet in length and provided with expansion joints. Expansion filler shall also be used at pours against buildings, walls or other hard fixed objects. Contractor is responsible for securing areas with curing concrete and shall supply barricades or watchmen as necessary to prevent defacement of concrete surfaces.

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

Concrete for sidewalk shall be 4,000 psi at 28 days, ¾ inch coarse aggregate, 610 pounds cement per cubic yard, 7% air entrained (AASHTO – M154), Type A water reducing admixture (AASHTO – M194), 3-4 inch slump, Type II dark colored admixture, and fiber mesh.

Color Admixture:
The Contractor shall submit the names of the manufacturers of the color admixture and all related materials propose for use to the MassDOT Research and Materials Lab for approval. After receiving approval from the Research and Materials Engineer, a Concrete Coloring Procedure as specified in ITEM 701. shall be submitted for approval to the Town of Lexington and the Engineer. The Concrete Coloring Procedure shall completely describe all manufacturer’s guidelines and recommendations to be followed to ensure proper use of the concrete coloring admixture.

After approval of the Concrete Coloring Procedure, at least one Concrete Test Panel shall be constructed in accordance with the Concrete Coloring Procedure. The coloring and finish of the test panel shall be allowed to develop for at least seven days or the period recommended by the manufacturer, whichever is longer. Following the curing period, the Engineer and Town shall review the Test Panel for acceptability. No material shall be ordered, or work performed for the finished structure until the Concrete Test Panel is approved by the Engineer.

The concrete coloring agent shall be a color-conditioning admixture that meets the requirements of ASTM C 494 as manufactured by:

1. CHROMIX admixture, as manufactured by L.M. SCOFIELD Company, Douglasville, GA 30134
2. DYNAMIC COLOR SOLUTIONS, Inc., 2024 South Lenox Street, Milwaukee, WI 53207

3. DAVIS COLORS, 3700 East Olympic Blvd., Los Angeles, CA 90023
4. An Engineer approved equivalent

The color of the admixture shall be achieved by adding 1 ½ to 2 pounds of lamp black per cubic yard of cement concrete mix at the plant.

The Contractor shall follow all of the manufacturer's written instructions and recommendations. The color supplier shall provide a technical representative experienced in the production of concrete with the approved coloring admixture to the producers of the concrete during the construction of the Concrete Test Panel. The technical representative shall remain available as the performance and appearance of the concrete is proven to the satisfaction of the Engineer and the Town.

The Contractor shall make arrangements with the Engineer to have an authorized representative present during the preparation, mixing and testing of trial mixes. The arrangements shall be made at least two weeks before conducting the trial mixes. Each trial mix shall consist of at least three cubic yards of concrete.

Architectural Coloring Procedure

The Contractor shall submit a Concrete Coloring Procedure to the Engineer and the Town of Lexington for approval. The Concrete Coloring Procedure shall include the following:

- Color admixture sample color chips, manufacturer's product description, manufacturer's recommendations and instructions and the Contractor's proposed construction methods;
- Stain sample color chips, manufacturer's product description, manufacturer's recommendations and instructions, the Contractor's proposed application procedures and worker and environmental protection systems;
- Typical repair methods for concrete and stain defects.

Upon approval of the Concrete Coloring Procedure by the Engineer and the Town of Lexington, the Contractor shall construct at least one Concrete Test Panel. At the option of the Contractor, one or more additional test panels with different quantities of coloring agent to produce a lighter shade may be constructed for review by the Engineer or Town of Lexington.

Concrete Test Panel

The Contractor shall construct a 5' x 10' Concrete Test Panel on the site. The Test Panel shall provide, but not be limited to, a representation of the following:

- The color of the color-conditioned concrete;
- Broom finish;
- The contrast between the color-conditioned concrete and the detectable warning panel at ramps;
- The uniformity of the coloring produced by the concrete stain;
- Worker and Environmental safety practices to be used during construction;
- Methods that would be used to repair typical concrete defects and/or damage such as, but not limited to, bug holes, honeycombing, chips and form tie rod holes;
- Methods that would be used to repair any defects caused in conjunction with the use of the stain.

Detectible waning panels shall be installed as shown on the Plans and as detailed in MassDOT Construction Standards details E 107.6.5. The tile shall conform to Americans with Disabilities Act (ADA) requirements and color shall be yellow.

Fiber mesh:
Fiber mesh fibers (100% virgin polypropylene, collated, fibrillated fibers) at a rate of 1.0 - 1.5 lb. per cubic yard of concrete shall be added for reinforcement. Fiber mesh shall be FIBERMESH 150, manufactured by PROPEX Concrete Systems or an approved equal. Installation shall be per manufacturer's recommendations.

Concrete Sealer:
All cement concrete exposes surfaces shall be treated with a concrete penetrant/sealer in accordance with Section 901.72 of the Standard Specifications. The test area shall be 4 ft. by 4 ft. using manufacturer’s application instruction for the approval of the Town.

Contractor is responsible for securing areas with curing concrete, and shall supply barricades or watchmen, as necessary to prevent defacement of concrete surfaces.

Control Joints shall be sawcut at a maximum six-foot (6’) intervals.

Payment under this Item shall include temporary removal of obstructions for the purposes of forming and pouring sidewalks that are not specifically paid for under another item.

Payment under this Item shall include temporary removal of obstructions (such as fences) for the purposes of forming and pouring sidewalks that are not specifically paid for under another item.

Payment shall be Contract Unit Prices bid per Square Yard of cement concrete sidewalk, and driveways, complete in place, with color admixture and fiber reinforcing, concrete penetrant (sealer), installation of detectable warning panel to the satisfaction of the Engineer, including but not limited to, fine grading and compaction, fiber reinforcement, sawcutting, protection and finishing.

All excavation will be paid under 120.1 Unclassified Excavation.

ITEM 702. HOT MIX ASPHALT SIDEWALK OR DRIVEWAY TON

The work under this Item shall conform to the relevant provisions of Section 701 and include hot mix asphalt driveways and walkways, especially areas where newly constructed cement concrete sidewalks and driveways meet existing asphalt walks and driveways. Saw cutting of up to 6 inches of HMA or providing a key way necessary to provide a stable joint with existing asphalt will be considered incidental to the handwork installation. No additional compensation will be made for saw cutting asphalt or cutting a keyway.

Tonnage shall be determined by weight slips submitted to the Engineer. Where weight slips are unavailable, the inch per square yard method shall determine tonnage (inches of approved thickness, multiplied by square yard unit measurement, multiplied by the volume to weight conversion factor of 0.056 tons/inch/square yard). This calculation will also be used to confirm quantities.

The work under this Item shall include the shaping of HMA to transition from the HMA Curb to the depressed driveway openings, if required.

The hot mix asphalt (HMA) Walks and Drives with Superpave HMA mixtures shall be paved in accordance with Section 701 of the Standard Specification which shall be the basis for the work and paid for under

Item 702. HMA Drive and Walk Surfaces. The Superpave HMA for Item 702 shall not be subject to QA sampling and testing.

Payment shall made at the Contract Unit Price bid per Ton of hot asphalt mix placed and shall include all labor and materials necessary for placement, including but not limited to sawcutting, fine grading and compaction, and all other work necessary complete installation.

All excavation will be paid under 120.1 Unclassified Excavation.

ITEM 706.01 BRICK PAVERS FOR SIDEWALKS SQUARE YARD
ITEM 706.02 BRICK PAVERS FOR DRIVEWAYS SQUARE YARD
ITEM 706.03 BRICK PAVERS FOR WHEELCHAIR RAMP SQUARE YARD

The work under these Items shall conform to the relevant provisions of Section 701 of the Standard Specifications for Highways Bridges and Supplemental Specifications Section 706 as Described in Division II of Town of Lexington and following:

The work shall include supplying materials for and the installation of brick sidewalk areas on concrete base with sand setting bed as shown on the plans, in accordance with these specifications, and/or as directed by the Engineer.

Brick shall be laid with a tight joint and placed on a fiber reinforced cement concrete base with per section 701 of supplemental section of Town standards.

Brick is to be laid in a 90-degree Herringbone Pattern running parallel to the curb throughout the project.

QUALIFICATIONS

The Brick Paving for Sidewalks, Driveways, and Wheelchair Ramps (including all cement concrete work) must be installed by a contractor or subcontractor with five years' experience on projects of a similar size and character. The Contractor will be required to submit the name of the subcontractor he intends to employ and verification of experience, capability, and facilities to the Engineer for approval.

The Contractor shall follow the Interim Subsection 701 under Division II of the supplemental specification for cement concrete sidewalk, driveway and wheelchair ramp installation work in brick area.

SUBMITTALS

Material Samples:

The Contractor will be required to submit six samples of brick to the Engineer for approval before ordering. The samples shall demonstrate the final full range of surface color, finish, and shape that will be provided throughout the project. All samples shall be full size.

Reports:

Test reports and certificates shall be submitted for each material and paving element and shall include particle size and range, classification, traffic type, size and tolerance application.

Shop Drawing:

Contractor Shall submit a shop drawing depicting the herringbone layout panel locations with brick edging and pattern as noted above and as shown on the details.

Sample Panels:

Well in advance of installing the brick pavers, three (3) sample 8-foot x 8-foot panels showing three different blends of the brick paver using a plywood base shall be constructed at the site, as directed by the Engineer for the Engineer's approval of material, workmanship, range of color, bond and texture of surface. Sufficient time shall be given to the Engineer and the Town to view and approve the materials, method of laying, and workmanship. The materials and method shall be satisfactory to the Engineer who shall be the sole judge of its acceptability. Sample panels remain on site at all times until otherwise directed by the Engineer.

MATERIALS

All materials shall be delivered, stored, and handled to preclude damage of any nature. Manufactured materials shall be delivered and stored in their original containers, plainly marked with product and manufacturer's name.

Brick Pavers:

Shall be true pavers, 2 1/4 inch by 4 inch by 8 inch straight edge, extruded, (wire cut) and shall be Weather Class SX, Type I, Application PX. Paver shall conform to ASTM C 1272 Type R. Brick shall have an average comprehensive strength not less than 8,000 psi and average water absorption of no more than 6% (24-hour submersion at room temperature). The radius of rupture shall be not less than 1,000 pounds per square inch.

Bricks shall be manufactured by Belden Brick Company, Reading, PA. or approved equal. Color range shall be Regimental Full Range by Belden Brick Company or approved equal.

Fine Aggregate:

Fine Aggregate for setting bed and joints shall be fine, clean, hard, sharp material free from organic matter, shells, silt, clay, stones, or other deleterious matter and shall not contain more than 1% by weight of crusher dust. The maximum percentage of wear shall not exceed 25%. Color to be dark gray using granite as the base stone from which the sand is crushed and produced.

Fine Aggregate shall meet the following gradation:

Sieve Size	**Percent Passing**
3/8 inch	100
No. 4	95-100
No. 8	70-100
No. 30	25-60
No. 50	10-30
No. 100	5-20
No. 200	0-10

Setting Bed:

Sand for bedding shall be fine, clean, naturally occurring material with angular and subangular shaped particles, with a maximum size of 3/16 inch concrete sand conforming to the requirements of ASTM C 33, Specification for Concrete Aggregate. Sand rich in silica-based minerals is desirable. Manufactured limestone shall not be used.

The Contractor shall place the sand setting bed and compact the bed to a finished thickness of 1 inch. Compaction shall be by a mechanical vibrator resulting in a compaction of ninety-five percent (95%) of maximum density. Once compacted, the top 1/4 inch shall be loosened with a hand rake.

Concrete:

Concrete base shall be per Section 700 of the Standard Specifications. (Air entrained 4000 psi, 3/4“, 610)

Edging:

Edging shall be 400 Series Heavy Duty Edge Restraint aluminum brick edging, 1" high x 2" wide, deco-black finish, as manufactured by Curv-Rite, Inc., Wayland, MI. Edging shall be bolted into the concrete.

METHOD OF CONSTRUCTION

Contractor is cautioned that the visual effect and appearance of the surface is an extremely important project element and that its installation must conform to the details and intent of the drawings and specifications.

All work shall conform to the latest edition of the MassDOT and AAB/ADA Standards. The Contractor is hereby notified that they are ultimately responsible for constructing all project elements in strict compliance with the current AAB/ADA rules, regulations and standards.

The AAB Rules and Regulations specify maximum slopes and minimum dimensions required for construction acceptance. There is no tolerance allowed for slopes greater than the maximum slope nor for dimensions less than the minimum dimensions.

All wheelchair ramp joints and transition sections which define grade changes shall be formed, staked and checked prior to placing cement concrete. All grade changes are to be made at joints.

Base Layers:

The Contractor shall place compacted gravel borrow base to a finished thickness of 8 inches. Materials for base layers shall meet the requirements of M1.03.0 (Type b).

The Contractor shall place cement concrete base per Item 701 of the Specification. The thickness of the concrete shall be 4 inches. Concrete shall be fiber reinforced. The top surface shall be screed finished Core drill (2" diameter) concrete slab at low point/s at a maximum of five (5) feet on center as shown on the drawings or as directed by Engineer. Fill core holes with peastone or an equally free draining material. Cover core holes with Marifi 100X Drainage Fabric or equal material.

The thickness of the concrete shall be 6 inches for driveway apron and wheelchair ramp areas.

Placing Bricks:

Contractor shall verify curbing is acceptable and true to line and grade prior to beginning installing bricks.

Brick is to be laid in a 90-degree Herringbone Pattern running parallel to the curb throughout the project.

The walkway on the North side of Massachusetts Avenue between Depot Square and Edison Way is radial. Lay brick in a 90-degree Herringbone Pattern running parallel to the roadway and align to the tree planter curbs. Lay the brick in panel sections to accommodate the radius. Panels shall meet in inconspicuous locations. **Contractor Shall submit a shop drawing depicting the panel locations and with separate details showing the brick edging and pattern as shown on the drawings. Prior to submitting the shop drawing, contractor shall meet with the Engineer at this location to discuss the layout.**

Bricks shall be placed on a 1-inch sand layer. Place brick paver and tap lightly to a true surface. Joints between bricks and other objects shall be 1/8 inch. Where geometry of paving areas, including along curbing or other objects, does not allow receiving full size bricks, bricks shall be saw cut to fit.

Leveling of paver should be done as the setting operation proceeds so that it is not necessary to disturb the pavers set earlier. The Contractor shall place Fine Aggregate to fill joints completely before vibration to maximize interlock at the bottom of the joint. Coarse particles that that do not fall into joints shall be swept off the pavement. After vibration, finer joint sand may be placed so that it penetrates to the bottom of the joints. Polymeric sand shall not be used between the joints.

Pavers shall be carefully placed by hand in straight courses, maintaining accurate alignment, consistent jointing, and a uniform top surface. Newly laid pavers shall be protected with plywood panels on which workers can stand and advance protective panels, as work progresses, but maintain protection in areas subject to continued movement of materials and equipment to avoid creating depressions or disrupting alignment of pavers.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Brick Pavers for Sidewalk, Driveways, and Wheelchair Ramps will be paid for at the contract unit price per Square Yard, complete in place. Said price shall be considered as full compensation for furnishing and installing all materials including sawcutting, fine grading and compacting, concrete base, brick pavers, fine aggregate, and all other materials, labor, equipment tools, appurtenances, and incidentals necessary to satisfactorily finish the this work, complete and accepted by the Engineer.

All excavation will be paid under 120.1 Unclassified Excavation.

Gravel borrow will be paid for at the contract unit price per cubic yard under Item 151.

ITEM 706.31 BRICK/PAVER SURFACE REMOVED & RELAID SQUARE YARD

The work under this Item shall conform to the relevant provisions of Supplemental Specifications Section 706 as Described in Division II of Town of Lexington and following:

The work under this Item shall include the removal and resetting or relaying of brick and paver surfaces to remain but disturbed by construction or required to transition the existing surfaces to the grading of proposed sidewalk surfaces. Lines and grades shall be consistent with the new sidewalk construction as shown on the plans and established by the Engineer.

The brick shall be reused where possible. New brick shall be similar in appearance to the brick walks which are removed, or which abut a new or reconstructed walk surface. If existing bricks are broken or if new units are necessary to reset the walks, they shall be of the same color and texture as the existing. All existing units shall be thoroughly cleaned before being set. All brick or paver surfaces shall match existing base materials laid on a minimum of 8” gravel borrow base.

Resetting brick pavers shall use the same sand bedding and jointing materials and installation techniques as described above.

All walks to be removed and re-laid shall conform to AAB and ADA rules and regulations.

It is the intention of this special provision that the reset brick walks at the new locations shall conform as close as possible in every detail to the existing walks and driveways.

Payment under this Item shall be made at the Contract Unit Price bid per Square Yard complete in place. This price shall be full compensation for replacing broken bricks, pavers or stones, removing, cleaning and relaying them, furnishing and placing the bedding and jointing materials including the concrete base as required to match existing, excavation, fine grading and compaction, gravel borrow and all other materials, labor and equipment required to make the work complete. Concrete base thickness shall be similar to existing.

ITEM 706.51 COBBLESTONE REMOVED & RELAID SQUARE YARD

The work under this Item shall conform to the relevant provisions of Supplemental Specifications Section 706 and following:

The work under this Item shall include the removal and resetting or relaying of cobblestone surfaces to remain, but disturbed by construction or required to transition the existing surfaces to the grading of proposed sidewalk surfaces. Lines and grades shall be consistent with the new sidewalk or driveway construction as shown on the plans and established by the Engineer.

The cobblestone shall be reused where possible. New cobblestone shall be similar in appearance to the existing cobblestone walks which are removed or which abut a new or reconstructed walk surface. If cobblestone are broken or if new units are necessary to reset the walks, they shall be of the same color and texture as the existing. All existing units shall be thoroughly cleaned before being set. All cobblestone or paver surfaces shall match existing base materials laid on a 6-inch concrete base on a 8” gravel borrow base.

The Bedding Sand used for the installation of the new cobblestone shall be used to reset the described bricks/pavers with the same specified installation techniques. This work shall also use the same Joint Sand and installation techniques.

It is the intention of this special provision that the reset cobblestone walks at the new locations shall conform as close as possible in every detail to the existing walks and driveways.

Payment under this Item shall be made at the Contract Unit Price bid per Square Yard complete in place. This price shall be full compensation for replacing broken cobblestone, cobblestone, removing, cleaning and relaying them, furnishing and placing the bedding and jointing materials including the concrete base as required to match existing, excavation, fine grading and compaction, gravel borrow and all other materials, labor and equipment required to make the work complete. Concrete base thickness for driveways shall be minimum of 6 inches.

ITEM 707.11 R&R EXISTING WOOD BENCH EACH

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include removing, storing, stacking, cleaning, repairing and resetting existing (5’ +/- length), wood (teak) benches.

There are 55 existing wood benches that are to be removed, cleaned, repaired and reset. If, in the opinion of the Engineer, a bench is not able to be reused, that bench shall be removed and disposed, and a new bench provided under Item 707.12. Before disposing, the Contractor shall remove the existing plaque and install on the replacement bench.

All of the existing benches within the project area have dedication plaques/plates attached. The location of each plaque/plate is unique and must be retained (regardless of the reuse of an existing or a new replacement bench). The Engineer will provide information on all plaque locations to the Contractor.

SUBMITTALS

The Contractor shall provide product data on the water-based teak cleaner.

MATERIALS

Water-based teak cleaner shall be used.

Steel angle piece for mounting bench to brick or concrete surface shall be 2-inch x 2-inch x 1/8” steel with a ¼” hole drilled through each leg of the angle piece. Hardware shall include ¼” x 1-inch wood screws use each bench leg and 3/8” x 6-inch Hilti fasteners for concrete. Steel angle piece shall be painted black with rust-proof paint.

METHOD OF CONSTRUCTION

Existing wood bench shall be sanded where needed and cleaned with a water-based teak cleaner. The intent is not to restore the original honey color of each piece.

Areas of splintering, broken slats, and loose joinery shall be repaired.

Restored benches shall be delivered to the site. Final location of benches shall be coordinated with the existing bench plaque locations and as directed by the Engineer. Attach hardware to benches and benches to the concrete base or cement concrete sidewalk. See plans for locations and conditions.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

R&R Existing Wood Bench will be paid for at the contract unit price per Each, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including removing, storing, stacking, sanding, cleaners, fasteners, attaching plaques, and mounting hardware required to complete the work to the satisfaction of the Engineer.

If concrete foundation required for wood bench outside of the sidewalk area will be paid under Item 701.

ITEM 707.12 WOOD BENCH – TYPE B1 EACH
ITEM 707.13 WOOD BENCH – TYPE B2 EACH
ITEM 707.14 WOOD CHAIR EACH

The work under these Items shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include furnishing and installing new teak wood site furniture as shown on the plans, in accordance with these specifications, and/or as directed by the Engineer.

SUBMITTALS

The Contractor shall provide manufacturer data sheet showing finish and all components including mounting brackets and hardware.

MATERIALS

Wood benches and chairs shall conform to Town of Lexington standards. Wood Bench Type B1 shall be “London Seat 150” (5’ +/- length), Backless Wood Bench Type B2 shall be “London Seat 150” (5’ +/- length), and wood chair shall be “London Armchair”, all solid teak, as manufactured by Barlow Tyrie. Local representative for this product line is Robb Scagnetti, Clappers Home and Hearth, 348 Boston Post Rd, Sudbury, MA 01776 (978-443-2380).

Steel angle and mounting hardware shall be as described in Item 707.11.

METHOD OF CONSTRUCTION

Install individual site furniture components level and plumb. Attach hardware to benches and benches to the finished cement concrete walk surface or the cement concrete base under the brick pavers as shown on the drawings.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Wood Bench Type B1 (707.12), Backless Wood Bench Type B2 (707.13), and Wood Chair (707.14), will be paid for at the contract unit price per Each, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including steel angle, fasteners, and mounting hardware required to complete the work to the satisfaction of the Engineer.

ITEM 707.15 CAROUSEL TABLE AND SEATS EACH

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include furnishing and carousel table and seats at the locations shown on the plans and as specified herein.

SUBMITTALS

The Contractor shall provide manufacturer data sheet showing finish and all components including mounting brackets and hardware.

MATERIALS

Round table with wood top and three (3) mesh hoop seats shall be “Carousel Table” unit manufactured by Landscape Forms, Kalamazoo, MI., 1-800-430-6206 ext. 1325, or approved equal. Unit shall be fully ADA compliant and meet 521 CMR 19.5.2.

Table shall be casual height, 30-inch round steelhead with wood top and factory installed umbrella hole. Seats, with backs, shall be “hoop” style. Wood shall be Thermally Modified Ash.

METHOD OF CONSTRUCTION

Corrosion resistant mounting hardware shall be provided and installed per the manufacturer’s recommendations. Contractor shall coordinate installation requirements and parts with the manufacturer.

Install individual site furniture components level and plumb.

Install metal table with seats with surface mounting hardware that extends into the concrete base under the pavers as shown on the plans or as directed by the Engineer.

Repair minor damages to finish in accordance with manufacturer’s instructions or as directed by the Engineer. Remove and replace damaged components that cannot be successfully repaired as directed by the Engineer. Clean individual components with mild cleaner in accordance with manufacturer’s instructions using a mild cleaner as approved by the manufacturer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Carousel Table and Seats (707.15) will be paid for at the contract unit price per Each, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required fasteners, tools and equipment required to complete the work to the satisfaction of the Engineer.

ITEM 707.21 TRASH RECEPTACLE EACH
ITEM 707.22 BIG BELLY TRASH AND RECYCLING EACH

The work under these Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include furnishing and installing trash receptacles and “Big Belly” trash and recycling units at the locations shown on the plans and as specified herein.

SUBMITTALS

The Contractor shall provide manufacturer data sheet showing finish and all components including mounting brackets and hardware.

MATERIALS

Trash receptacle shall be Town of Lexington standard, model “S-42”, Ironsites Series, 36-gallon steel with tapered formed lid and black plastic liner, as manufactured by Victor Stanley, Inc., Dunkirk, MD 20754, 1-800-368-2573, or approved equal.

“Big Belly” trash and recycling shall be Town of Lexington standard – Big Belly with bottle/can recycling unit as manufactured by Big Belly Solar, 150 A Street, Needham, MA., 1-888-820-0300. Capacity shall be 50-gallon, non-compacting.

METHOD OF CONSTRUCTION

Install individual site furniture components level and plumb.

Install trash receptacle and “Big Belly” trash and recycling with surface mounting hardware that extends into the concrete base under the pavers as shown on the plans or as directed by the Engineer.

Repair minor damages to finish in accordance with manufacturer’s instructions or as directed by the Engineer. Remove and replace damaged components that cannot be successfully repaired as directed by the Engineer. Clean individual components with mild cleaner in accordance with manufacturer’s instructions using a mild cleaner as approved by the manufacturer.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Steel trash receptacle (707.21) and Big Belly trash and recycling (707.22) will be paid for at the contract unit price per Each, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, required to complete the work to the satisfaction of the Engineer.

ITEM 707.31 METAL TREE GRATE – TYPE A EACH

ITEM 707.32 METAL TREE GRATE – TYPE B EACH

The work under these Items shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include furnishing and installing tree grates at the locations shown on the plans and as specified herein.

SUBMITTALS

The Contractor shall provide manufacturer data sheet showing finish and all components including a detailed shop drawing of frame and grate installation at concrete sidewalk locations, concrete paver locations, and along granite curb for approval of the Engineer prior to ordering. Shop drawing shall include custom removable panel in grate and method of securing with tamper-proof hardware.

MATERIALS

Tree Grates shall be Metro Series, as manufactured by Ironsmith, Inc., Palm Desert, CA (1-800-338-4766) or approved equal. Tree grate shall be cast gray iron and shall have 1/2” maximum slot openings. Tree opening shall be 17-inch square. Tree grate shall be unfinished. Frame shall be heavy steel angle, welded.

Tree grate – Type A, 5’x10’ is model 6072x2 with frame model 60x120F
Tree Grate – Type B, 4’ x 10’ is model 12072 with frame model 48x120 F

Tree grates to have custom removable panel as shown on the plans.

METHOD OF CONSTRUCTION

The Contractor shall install tree grates where shown on the plans, flush and leveled with surrounding paved surfaces.

Install steel angle frame flush and level. Frame must not slope in more than one (1) direction. Use spreaders or stakes to keep frame from distorting or twisting as needed. Install frames per drawings and manufacturer’s recommendations. Grind pads on underside of tree grate to prevent rocking.

Coordinate installation of tree grate with tree planting and outdoor power ground box.

Clean frame and grate. Remove any construction debris etc. from tree pit.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Tree Grate – Type A (707.31) and Tree Grate – Type B (707.32) will be paid for at the contract unit price per Each, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required excavation, foundations, backfill, fasteners, materials and equipment, required to complete the work to the satisfaction of the Engineer.

ITEM 707.81 BOLLARD REMOVED AND RESET EACH

All work shall be done in conformance with the applicable sections of the Standard Specifications. Removal and resetting of steel bollard shall be paid under Item 707.81.

The work shall consist of removing steel bollards and resetting them in accordance with these specifications and in close conformity with the lines and grades shown on the plans or as directed by the Engineer. Existing paint, if damaged during this work, shall be repainted as directed by the Engineer. The Contractor shall coordinate with NGRID-Gas for the final location of the bollards.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Existing steel bollards which, in the judgment of the Engineer, are unsuitable for reuse due to deterioration, or from damage caused by the Contractor's operation, shall be replaced with new materials of matching type, size. No separate payment will be made for the excavation, footing, backfill, concrete fill of pipe and any necessary new materials and all costs shall be included in the unit bid price.

Compensation will be at the contract unit price bid per each, and shall include all labor, tools and materials and necessary incidentals to remove and reset steel bollards complete and in place and restore disturbed areas.

ITEM 707.91 BIKE RACK – TYPE A EACH
ITEM 707.92 BIKE RACK – TYPE B EACH

The work under these Items shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include furnishing and installing bike racks (Type A & B) at the locations shown on the plans and as specified herein.

SUBMITTALS
Contractor shall furnish shop drawings showing dimensions of each style of bike loop including pipe size, shape, dimensions, finish, and depth of embedment.

WARRANTY
Provide written warranty, signed by the contractor, fabricator, and installer agreeing to repair or remove, replace and reinstall at no additional cost any of the above items that become defective within three years from date of substantial control.

MATERIALS
Bike Rack – Type A shall be the "Double Loop Bike Rack" style as provided by Tree Top Products, 222 State Street, Batavia, IL. 60510, 1-866-511-5642, www.treetopproducts.com or approved equal. Bike rack vertical support shall be 3.5-inch, 11-gauge steel and locking rings shall be 1-5/8" 11-gauge steel, galvanized pipe with a powder-coat, color black. Both in-ground and surface mounting are specified and shown on the drawings. Corrosion resistant hardware shall be supplied by others.

Bike Rack – Type B shall be the "Hoop Rack, Heavy Duty" style as manufactured by Dero, Minneapolis, MN, 1-888-337-6729, or approved equal. Bike rack shall be 2-inch Schedule 40 (2.375" OD), galvanized pipe with a powder-coat, color black. Both in-ground and surface mounting are specified and shown on the drawings. Corrosion resistant hardware shall be supplied by others.

METHOD OF CONSTRUCTION
The Contractor shall coordinate necessary installation parts with manufacturer or supplier and install per the manufacturer's recommendations.

Install bike racks level and plumb either in-ground with 4,000 psi concrete footing or surface mount, as shown on the plans or as directed by the Engineer.

Repair minor damages to finish of bike racks in accordance with manufacturer's instructions or as directed by the Engineer. Remove and replace damaged components that cannot be successfully repaired as directed by the Engineer. Clean individual components with mild cleaner in accordance with manufacturer's instructions and recommendations.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Bike Racks – Type A (Item 707.91) and Type B (Item 707.92) will be paid for at the contract unit price per Each, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required excavation, foundations, backfill, crushed stone, mounting hardware and fasteners as required to complete the work to the satisfaction of the Engineer.

ITEM 708. 1 WOOD PLANTER EACH

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include furnishing Wood Planters as shown on the drawings and delivery of the assembled planters to the Town.

SUBMITTALS

The Contractor shall provide shop drawing showing size, materials, construction for the planter.

MATERIALS

Wood Planter shall be 28-inch "Plaza" planter manufactured by Landscape Forms, Kalamazoo, MI., 1-800-430-6206 ext. 1325, or approved equal. Planter shall come with a drop-in fiberglass liner with preformed drain hole. Planter shall have unfinished wood sides made from Thermally Modified Ash, with metal corners. Planter shall be free-standing and come with adjustable stainless-steel glides.

METHOD OF CONSTRUCTION

The Contractor shall deliver the assembled, un-filled, wood planters with fiberglass liners to the Public Services Building, 210 Bedford Street, Lexington, MA 02420.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Wood Planter (Item 707.81) will be paid for at the contract unit price per Each, delivered. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including fasteners, mounting hardware, required to complete the work to the satisfaction of the Engineer.

ITEM 708.2 CELL PHONE CHARGING STATION WITH ACCENT LIGHT EACH

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include furnishing and charging station at the location shown on the plans and as specified herein.

REFERENCES

Comply with requirements of applicable local codes, NEC, UL, and NEMA Standards pertaining to charging stations, power pedestals, and components. UL listed to meet NEMA 3R requirements for use in outdoor locations. cULus listed per File No. E479489 in compliance with UL Standard 1773.

Cell Phone Charging Station and power pedestals shall comply with ADA requirements.

SUBMITTALS

Product Data: Submit for cell phone charging stations, warranties and components.

Shop Drawings: For cell phone charging station and components. Include plans, specifications, warranties, elevations, sections, details, and attachments to foundations and to other work.

Samples: Submit three (3) samples for each type of cell phone charging station component specified with required color and finish. Show standard color and finish ranges available.

MATERIALS

Cell Phone Charging Station shall be NEMA 3R listed for outdoor use. Charging Station shall be model BM-CSA-1G1U-LBLK, Two-Gang Outdoor Charging Station with Accent Light with one (1) weather-resistant GFCI and one (1) 4-port 4.2A USB outlet. Charging station shall include timer for lighting circuit. Accent light shall be 7-watt LED, 4000K. Station shall be manufactured by Landscape Forms, Kalamazoo, MI., 1-800-430-6206 ext. 1325, or approved equal. Side mounted shelves shall be provided. Standard color to be black and approved by Engineer.

METHOD OF CONSTRUCTION

Strictly comply with manufacturer's installation instructions and recommendations and approved shop drawings. Coordinate charging stations installation with adjacent work to ensure proper clearances and to prevent electrical hazards. Remove any burrs or sharp edges on material.

Anchor Bolts: Install plumb using manufacturer-supplied template, uniformly spaced.

Stub up conduit to a height of eight (8) inches for standard power installations. If using the A/V kit, run the conduit up to bottom of power module/door.

Clean exposed surfaces using non-abrasive materials and methods recommended by manufacturer.

Protect charging stations and components from damage until acceptance. Replace charging stations components which are damaged during construction.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Cell phone charging station (Item 708.2) will be paid for at the contract unit price per Each, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required excavation, foundations, backfill, crushed stone, conduits, wiring, power supply, fasteners, mounting hardware, required to complete the work to the satisfaction of the Engineer.

ITEM 709.1 MODULAR SOIL CELLS SQUARE YARD

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and the following.

This work shall consist of furnishing and installing modular soil cell system including cell assemblies, geotextile, geogrid, aggregate, subbase material, and root barrier at the locations shown on the plans and as specified herein. Planting Soil backfill for Modular Soil Cells is Item 761.3 Soil Type C.

DEFINITIONS

AGGREGATE BASE COURSE: Aggregate material between the paving and the top of the Modular Soil Cell deck below, designed to distribute loads across the top of the deck.

AGGREGATE SETTING BED FOR PAVERS: Aggregate material between the aggregate base course and unit surface pavers, designed to act as a setting bed for the pavers.

AGGREGATE SUBBASE: Aggregate material between the bottom of the Modular Soil Cell base and the compacted subgrade below, designed to distribute loads from the Modular Soil Cell bases to the subgrade.

BACKFILL: The earth used to replace or the act of replacing earth in an excavation beside the Silva Cell system to the excavation extents.

FINISH GRADE: Elevation of finished surface of planting soil or paving.

MODULAR SOIL CELL SYSTEM:

1. Modular Soil Cell: One assembled unit made up of 1 base, 6 post assemblies, and 1 cell deck.
2. Modular Soil Cell System: Two or more Modular Soil Cells used in combination with each other and with required accessories.

SUBGRADE: Surface or elevation of subsoil remaining after completing excavation, or top surface of a fill or backfill.

WALK-THROUGH: A process for light compaction of soils by walking through the soil following placement.

Reference Standards

1. American Association of State Highway and Transportation Officials (AASHTO):
    a. AASHTO H-20
2. ASTM International (ASTM):
    a. ASTM D448-12, Standard Classification for Sizes of Aggregate for Road and Bridge Construction
    b. ASTM D698-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12 400 ft-lbf/ft3 [600 kN-m/m3])
    c. ASTM D1241-07, Standard Specification for Materials for Soil-Aggregate Subbase, Base, and Surface Courses
    d. ASTM D3786/D3786M-13, Standard Test Method for Bursting Strength of Textile Fabrics-Diaphragm Bursting Strength Tester Method
    e. ASTM D4491-99a(2014)e1, Standard Test Methods for Water Permeability of Geotextiles by Permittivity
    f. ASTM D4533-D4533M-15, Standard Test Method for Trapezoid Tearing Strength of Geotextiles
    g. ASTM D4632-D4632M-15, Standard Test Method for Grab Breaking Load and Elongation of Geotextiles
    h. ASTM D4751-12, Standard Test Method for Determining Apparent Opening Size of a Geotextile
    i. ASTM D4833/D4833M-07(2013) e1, Standard Test Method for Index Puncture Resistance of Geomembranes and Related Products
    j. ASTM D5262-07(2012), Standard Test Method for Evaluating the Unconfined Tension Creep and Creep Rupture Behavior of Geosynthetics
    k. ASTM D6241-14, Standard Test Method for Static Puncture Strength of Geotextile and Geotextile-Related Products Using a 50mm Probe
    l. ASTM D6637-11, Standard Test Method for Determining Tensile Properties of Geogrids by the Single or Multi-Rib Tensile Method

SUBMITTALS

The Contractor shall provide installer qualifications prior to work on this system.

Submit Product Data:

For each type of product, submit manufacturer's product literature with technical data sufficient to demonstrate that the product meets these specifications.

Submit Samples:

a. Copy of manufacturers brochure with images of product. Contractor to supply a full-size soil cell on request.
b. One 6-inch square piece of geogrid.
c. One 6-inch square piece of geotextile.

QUALIFICATIONS

Provide proof of a minimum of five years continuous experience and expertise in management, handling and installation of Modular Soil Cells in large scale landscape construction projects including underground piping, chambers and vault structures, planting soils, and planter drainage systems. Site foreman shall have at least five years of experience and shall be on-site during all times of plant installation. Submit list of completed projects of similar scope and scale demonstrating capabilities and experience.

Installation Training from the Manufacturer (with written confirmation) will be considered in conjunction with lessor experience.

DELIVERY, STOARAGE AND HANDELING

Do not proceed with Work when subgrades, soils and planting soils are in a wet, muddy or frozen condition. Store components on smooth surfaces, free from dirt, mud and debris. Store under tarp to protect from sunlight when time from delivery to installation exceeds one week. Deliver packaged materials in original, unopened containers indicating weight, certified analysis, name and address of manufacturer, and indication of conformance with State and Federal laws, if applicable.

MATERIALS

Modular Soil Cells shall be “Silva Cells” as manufactured by DeepRoot Green Infrastructure, LLC, San Francisco, CA (800.458.7668) www. Deeproot.com, or approved equal.

Bases and Post shall be made from homopolymer polypropylene. Decks shall be fiberglass reinforced, chemically coupled, impact modified polypropylene. Strongbacks for temporary stabilization and landscape anchoring spikes shall be included.

Modular Soil Cells shall be modular, structural systems. Each Modular Soil Cell shall be structurally independent from all adjacent Modular Soil Cells for incorporating utilities and other site features as well as for future repairs. Modular Soil Cells shall be capable of supporting loads up to and including AASHTO H-20 when used in conjunction with approved pavement profiles. Modular Soil Cells shall be open on all vertical faces and horizontal planes and shall have no interior walls or diaphragms. Modular Soil Cells shall be capable of providing a large, contiguous, continuous volume of planting soil that does not inhibit or prevent the following:

a. Placement of planting soil
b. Walk through compaction
c. Compaction testing of planting soil, once in place
d. Movement and growth of roots
e. Movement of water within the provided soil volume, including lateral capillary movement
f. Installation and maintenance of utilities placed within, adjacent to, or below the Modular Soil Cell.

Each "Silva Cell 2" soil cell module (hereafter Modular Soil Cell or "cell") is composed of one base, 6 post assemblies, and one deck.

1x Cell 2 System:
a. Components: One base, six 1x posts, and one deck.
b. Assembled dimensions (each Cell): 47.2 inches long by 23.6 inches wide by 16.7 inches high.

2x Cell 2 System:
a. Components:
b. Assembled dimensions (each Cell): 47.2 inches long by 23.6 inches wide by 30.9 inches high.

Root Barrier: Recyclable, black, injection molded panels manufactured with a minimum 50 percent post-consumer recycled polypropylene plastic with UV inhibitors, and integrated zipper joining system which allows instant assembly by sliding one panel into another; for redirecting tree roots down and away from hardscapes.

Geogrid: Net-shaped woven polyester fabric with PVC coating, uniaxial or biaxial geogrid, inert to biological degradation, resistant to naturally occurring chemicals, alkalis, and acids; used to provide a stabilizing force within soil structure as the fill interlocks with the grid

Geotextile: composed of high tenacity polypropylene yarns which are woven into a network such that the yarns retain their relative position and is inert to biological degradation and resistant to naturally encountered chemicals, alkalis, and acids.

Plastic Cable Ties: A tensioning device or tool used to tie similar or different materials together with a specific degree of tension.

Aggregate Subbase (Below Modular Soil Cell Base): Complying ASTM D1241, Type I, Gradation B; Type I mixtures shall consist of stone, gravel, or slag with natural or crushed sand and fine mineral particles passing a No. 200 sieve or manufacturer approved equivalent.

Sieve	**Percent passing**
1-1/2 inches	100
1 inch	75-95
3/8 inch	40-75
No. 4	30-60
No. 10	20-45
No. 40	15-30
No. 200	5-15

Aggregate Base Course (Above Modular Soil Cell Deck): Same as the Aggregate Subbase noted above.
Backfill Material (Adjacent to Modular Soil Cells): Clean, compactable, coarse grained fill soil free of organic material, trash and other debris, and free of toxic material injurious to plant growth.

Planting Soil: Within Modular Soil Cell System, Refer to Item 761.3 Soil Mix C.

METHOD OF CONSTRUCTION

The Contractor shall hold a preconstruction meeting prior to the installation of the Modular Soil Cell System with the installer and their supervisor, manufacturer's technical representative, Owner and Engineer. Meeting will include, required submittals both completed and yet to be completed, the sequence of installation and the construction schedule, coordination with other trades, details, materials and methods of installation, and mock-up requirements.

Mock-up: Prior to the installation of the Modular Soil Cell system, construct a mock-up of the complete installation at the Project site in the presence of the Engineer. Minimum of 100 sq. ft. in area and including the complete Modular Soil Cell system installation with subbase, aggregate subbase, drainage installation, Modular Soil Cell decks, posts, and bases, base course aggregate, geotextile, geogrid, backfill, planting soil, and necessary accessories. The mock-up area may remain as part of the installed Work at the end of the Project provided that it remains undamaged and meets the requirements of the Drawings and Specifications.

Examine the conditions under which the Modular Soil Cells are to be installed. Carefully check and verify dimensions, quantities, and grade elevations. Notify the Contractor and the Engineer in writing in the event of conflict between existing and new improvements, of discrepancies, and other conditions detrimental to proper and timely completion of the installation. Do not proceed with Work when subgrades, soils and planting soils are in a wet, muddy or frozen condition.

Prior to the start of Work, layout and stake the limits of excavation and horizontal and vertical control points sufficient to install the complete Modular Soil Cell system.

Compact subgrade to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method, or as approved by the Engineer.

Install geotextile over compacted subgrade. Lay geotextile flat with no folds or creases. Install the geotextile with a minimum joint overlap of 18 inches.

Install aggregate subbase below the Modular Soil Cells to the depths indicated on the drawings. Extend subbase aggregate a minimum of 6 inches beyond the base of the Modular Soil Cell layout. Compact aggregate subbase to a minimum of 95 percent of maximum dry density at optimum moisture content in accordance with ASTM D698, Standard Proctor Method.

Install the Modular Soil Cell system in strict accordance with manufacturer's instructions and as specified herein; where requirements conflict or are contradictory, follow the more stringent requirements.

Provide layout and elevation control during installation of the Modular Soil Cell system to ensure that layout and elevations are in accordance with the drawings.

Establish the location of the tree openings in accordance with the drawings. Once the trees are located, mark the inside dimensions of the tree openings on the prepared subbase.

Locate and mark other Project features located within the Modular Soil Cell layout (e.g. light pole bases, utility pipes). Apply marking to identify the extent of the Modular Soil Cell layout around these features. Follow the layout as shown on the drawings to ensure proper spacing of the Modular Soil Cell bases. Refer to the drawings for offsets between these features and the Modular Soil Cells.

Check each Modular Soil Cell component for damage prior to placement. Reject cracked or chipped units.

Place the Modular Soil Cell bases on the compacted aggregate subbase. Start at the tree opening and place Modular Soil Cell bases around the tree openings as shown on the drawings.

Working from tree opening to tree opening, place Modular Soil Cell bases to fill in the area between tree openings. Maintain spacing no less than 1 inch and no more than 6 inches apart.

Follow the Modular Soil Cell layout plan as shown on the drawings. Install Modular Soil Cell bases around, over, or under existing or proposed utility lines, as indicated on the drawings.

Level each Modular Soil Cell base as needed to provide full contact with subbase. Adjust subbase material, including larger pieces of aggregate, so each base unit sits solidly on the surface of the subbase. Modular Soil Cell bases that rock or bend over any stone or other obstruction protruding above the surface of the subbase material are not allowed. Modular Soil Cell bases which bend into dips in the subbase material are not allowed. The maximum tolerance for deviations in the plane of the subbase material under the bottom of the horizontal beams of each Modular Soil Cell base is 1/4 inch in 4 feet.

AnchorModular Soil Cell base with 2 spikes per base. For applications where Modular Soil Cells are installed over waterproofed structures, use wood blocking or similar spacing system consistent with requirements of the waterproofing system to maintain required spacing.

For Modular Soil Cell systems that have a perforated drain line located inside or adjacent to the system, consult Drawings for layout and details. Install strongbacks on top of the Modular Soil Cell posts by snapping into place over installed posts prior to installing planting soil and backfill.

Install geogrid around the perimeter of the Modular Soil Cell system where the compacted backfill and planting soil interface.

Place the first lift of backfill material loosely around the perimeter of the Modular Soil Cell system, between the geogrid and the sides of the excavation. Place backfill to approximately the midpoint of the Modular Soil Cell post. Do not compact.

Place the first lift of planting soil, Item 761.3 Soil Type C, in the Silva Cell system to approximately the midpoint of the Modular Soil Cell post.

Compact the first lift of backfill material, previously spread, to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method or in accordance with Project Specifications for hardscape areas, whichever is greater.

Add and compact additional backfill material so that the final finished elevation is at approximately the same level of the placed planting soil within the Modular Soil Cells.

Place the second lift of backfill material loosely around the perimeter of the Modular Soil Cell system, between the geogrid and the sides of the excavation so that the material is 2 to 3 inches below the top of the posts. Do not compact.

Place the second lift of planting soil inside of the Modular Soil Cell to the bottom of the strongbacks. Walk through.

Install irrigation and electric conduit in accordance with the drawings and specifications. Remove only the minimum number of strongbacks needed to accommodate the Work and reinstall them immediately upon completion to maintain alignment of posts.

Obtain final approval by the Engineer of planting soil installation prior to installation of the Modular Soil Cell decks. Remove strongbacks, level out the planting soil, and immediately install decks over the posts below. Place deck over the top of the posts. Push decks down until the deck clips lock into the posts, snapping the deck into place. Fold the 12 inches of geogrid onto the top of the decks.

Place and compact final lift of backfill material to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method, such that the backfill is flush with the top of the installed deck. Do not allow compacting equipment to come in contact with the decks.

Place geotextile over the top of the deck and extend to the edge of the excavation. Overlap joints a minimum of 18 inches. Leave enough slack in the geotextile for the aggregate base course to push the geotextile down in the gaps in between the decks. Install the aggregate base course (including aggregate setting bed if installing unit pavers) over the geotextile immediately after completing the installation of the fabrics. Work the aggregate from one side of the layout to the other so that the fabric and aggregate conform to the Modular Soil Cell deck contours. Maintain equipment used to place aggregate base course completely outside the limits of the Modular Soil Cell excavation area to prevent damage to the installed system. Compact aggregate base course(s) to 95 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method. Do not drive vehicles or operate equipment over the completed aggregate base course.

Do not drive vehicles or operate equipment over the completed aggregate base course.

Install root barrier in accordance with manufacturer's installation instructions.

Remove rubble, debris, dust and silt from the top of the planting soil within the tree opening that may have accumulated after the initial installation of the planting soil within the Modular Soil Cells. Install additional planting soil within the tree openings, to the depths indicated on the drawings. Compact planting soil under the tree root ball to between 85 and 90 percent of maximum dry density in accordance with ASTM D698, Standard Proctor Method, to prevent settlement of the root ball. Place trees in accordance with the drawings.

Keep construction traffic away from the limits of the Modular Soil Cells until the final pavement profile is in place. The Modular Soil Cell system does not fully meet loading strength until the final paving is installed.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Modular Soil Cells (Item 709.1) will be paid for at the contract unit price per Square Yard, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required excavation, fine grading and compaction, foundations, backfill, crushed stone, fasteners, mounting hardware, required to complete the work to the satisfaction of the Engineer.

Excavation for Modular Soil Cells base will be paid under 120.1 Unclassified Excavation.

Planting Soil within the Modular Soil Cell System will be paid under 761.3, Soil Mix C.

ITEM 718.2 FLAG POLE HOLDER IN SIDEWALK EACH

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include installing black plastic (PVC) pipe, for flag poles, into the sidewalk in locations shown on the Construction Plans.

MATERIALS

1-1/2-inch nominal ABS pipe (outside dia of 1.9 inches) shall be Schedule 40 PVC meeting requirements of ASTM D 1785. Color of PVC pipe shall be black.

Crushed Stone shall be ¾ inch and meet the requirements of M2.01.4.

Cover core holes with Marifi 100X Drainage Fabric or equal material.

METHOD OF CONSTRUCTION

Locations shall be field verified for any conflicts prior to placement. Bricks shall be carefully cut and cement concrete walk shall be cored to accept the pipe. The PVC pipe shall be 12” long. Pipe shall be embedded through the cement concrete sidewalk and into the gravel base and sit on a layer of drainage fabric. The top of pipe shall be flush with the finish grade of the sidewalk.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Compensation for this Item will be at the Contract Unit Price per Each, which price shall include all labor, materials, pipe, fabric, coring, equipment, installation, and incidental costs necessary to complete the work to the satisfaction of the Engineer.

ITEM 745.3 WOODSHED REMOVED AND RELOCATED LUMP SUM

The work under this Item shall conform to the relevant provisions of the Standard Specifications for Highways Bridges and shall include the removal and, relocations of the existing wood in its new location within town as directed by the Engineer. The design intent is to reset the woodshed on a 6’x6’concrete pad so it does not sit directly on the ground.

The work shall also include, furnishing, installing and removing all necessary supports, bracing or other measures as necessary to perform the work.

SUBMITTALS

Prior to the start of work, a complete photographic survey shall be undertaken by the Contractor documenting the existing condition of the woodshed. Photos shall be labelled and shall be of a quality and resolution to visually present the documented conditions and shall specifically identify and note any pre-existing damage to the monument.

METHOD OF CONSTRUCTION

The Contractor shall schedule and hold a meeting on site with the Engineer to review and approve all woodshed removal and relocation measures prior to commencement of any monument removal work outlined in this Item. It is the intent of this specification that the woodshed be moved in one piece. The contractor shall disconnect power to the woodshed prior to moving.

The woodshed shall be delivered to a location within the Town of Lexington approved by the Town and the Engineer and set on 6-inch thick cement concrete pad above surrounding grade. The woodshed shall be secure in an upright and plumb position. The Contractor shall be responsible for transporting and protecting the woodshed from vandalism or other damage while in transit.

Once the woodshed is successfully removed, the Contractor shall remove and dispose of all existing foundation materials and components not to be reused in a satisfactory and legal manner. Under no circumstances shall any of the foundation be used as fill material.

BASIS OF PAYMENT

Relocation of woodshed will be paid for at the contract unit price per Lump Sum, complete in place. Said price shall be considered as full compensation for all labor, tools, equipment and materials, including all required excavation, removal of foundations, backfill, cement concrete pad, crushed stone, required to complete the work to the satisfaction of the Engineer. Said price shall also include all pre-construction documentation, transportation, and protection, of the woodshed including designing, furnishing, installing and removing all necessary supports, bracing or other measures as necessary to perform the work.

ITEM 748. MOBILIZATION LUMP SUM

This Item shall be for the mobilization/demobilization of personnel, equipment and materials at the work site by the Contractor. This Item shall include, but is not limited to the movement of equipment, personnel, material, supplies, etc. to and from the Work site; the installation and removal of temporary facilities (when not paid for separately), construction layout, the furnishing, deploying and repositioning of traffic management devices throughout the course of the project, including MUTCD compliant construction signs, cones, drums, etc. Traffic Management layouts and devices shall be in conformance with MassDOT's standard details and drawings for the development of Traffic Management Plans.

Payment under this Item shall be on a lump sum basis: 25% for mobilization, 25% for demobilization (minus retainage in both payments). The balance (minus retainage) will be incrementally paid for over the course of construction at intervals determined to be appropriate by the Engineer.

As per the MassDOT Standard Specifications the price bid for this Item shall not exceed 3% of the bid price.

The work of this Item shall also include any lighting plants for nighttime work.

Construction signing will be paid for under Item 852.

ITEM 751. LOAM BORROW CUBIC YARD

ITEM 765. SEEDING SQUARE YARD

The work under these Items shall conform to the relevant provisions of Section 751, 765, 767, 770 and as supplemented below. Work includes the placement of approved loam borrow, lime, fertilizer, and seed to restore all disturbed grassed areas as authorized by the Engineer.

Loam Borrow shall meet with Material Specifications M1.07.0. Loam Borrow shall pass a 3/8" screen and laid in a minimum depth of 6" after compacted and shall be free of grass and other unsuitable materials. The placement of new loam borrow shall be as follows.

In new areas or areas of significant disturbance, loam borrow shall be placed with a minimum depth of 6 inches after compaction. In existing grass areas to remain, or where there is minimal disturbance to the surface, depressions shall be filled and a top dressing of loam borrow shall be applied to a general depth of 1 inch after compaction. Prior to the application of the top dressing, the Contractor shall be required to mechanically aerate these areas by a means acceptable to the Engineer. Loam Borrow shall be used to fill depressions and shape the surface to provide for proper flow of drainage, as well as enhance the general appearance of these grassed areas. Areas adjacent to curbs and other such hard surfaces shall be pre-worked and tapered down 1 to 2 inches so as to allow the top dressing to end up flush with the hard surface.

Lime shall meet M6.01.0. Lime shall be applied at a rate of 75 to 100 lbs. per 1,000 square feet prior to seeding.

Fertilizer shall meet M6.02.0 and the applicable provisions of State and Federal laws and be furnished in containers plainly marked with the chemical analysis of the product. Fertilizer for general planting shall be slow release and shall be commercial grade 10-10-10, or sufficient to meet the recommendations for soil amendment. At least 40% of the nitrogen content shall be slow release, phosphorus shall be available phosphoric acid, and potassium shall be water-soluble potash.

Seed shall conform to the requirements of M6.03.0 Long Term Seed Mixes for Lawns and Slopes-Lawn Areas:

Grass Type	**Germination Proportion**	**Purity Minimum**
Seed Mix	% by Weight	% by Volume (Pure live seed)
Creeping Red Fescue Salt Tolerant varieties (Seabreeze, Dawson, Sea Links Cindy Lou or Rose)	70%	78%
Kentucky Bluegrass Salt Tolerant varieties (North Star or Moonlight)	15%	68%
Perennial Ryegrass Salt Tolerant varieties (Bright Star SLT, Salinas or Chaparal)	15%	85%

Seeding Rate: 150 LBS/ Acre

Seeding shall only occur between April 1 to May 15th, and August 15 to October 1st. The hydroseed mixture shall be applied at a rate sufficient to promote lush rapid growth of grass. Fertilizer in the hydro-seed mixture shall be applied at the rate of 30 lbs. per 1,000 square feet and seed in the hydro-seed mixture shall be applied at a rate of at least 150 lbs. per acre or 4 lbs. per 1,000 square foot.

Water grassed areas at the time of seeding. The Contractor shall be responsible for watering the hydro seeded areas daily. Watering shall occur daily for a minimum of two weeks unless natural rainfall and surface conditions warrant omitting watering. Evaluate soil moisture on a daily basis. The Engineer shall also evaluate the germination and growth of the grass. Any areas of poor establishment shall be repaired or replaced, as directed by the Engineer. The Town will provide water via a hydrant connection.

The Contractor shall protect the seeded areas from foot traffic by using barriers, stakes, ribbon, twine signage any other methods necessary to prevent disturbance of the finished seed bed. The Contractor shall maintain the grass areas at a maximum height of 2-1/2” by cutting with a hand mower at least three (3) times prior to review for Final Acceptance. The Contractor shall hand-pull weeds, or other growth that germinates that was not specified in the seed mix.

Payment under Item 751 shall be the Contract Unit Price bid per Cubic Yard, based on a 6 inch compacted depth, which price shall be full compensation for preparing surfaces; fine grading and compaction the sub base, furnishing, placing, raking, shaping and compacting new loam borrow; and furnishing and applying lime.

Payment under Item 765 shall be the Contract Unit Price bid per Square Yard, which price shall be full compensation preparing the loam surface, furnishing and applying hydro-seed, inclusive of fertilizer, as well as the maintenance of hydro-seeded areas as noted above.

Unless otherwise approved by the Engineer, surfaces disturbed outside the Limits of Work line shown for the Contractor's convenience, shall be restored as specified herein, at the Contractor's own expense.

NPDES STORMWATER
ITEM 756. POLLUTION PREVENTION PLAN LUMP SUM

This Item addresses the preparation and implementation of a Storm Water Pollution Prevention Plan required by the National Pollutant Discharge Elimination System (NPDES) and applicable Construction General Permit (CGP) issued by the U.S. Environmental Protection Agency (EPA).

Pursuant to the Federal Clean Water Act, construction activities which disturb one acre or more are required to apply to the EPA for coverage under the NPDES General Permit for Storm Water Discharges from Construction Activities. On February 16, 2012 (77 FR 12286), EPA issued the final NPDES Construction General Permit (CGP) for construction activity. The Contractor shall be fully responsible for compliance with the CGP. Should a fine or penalty be assessed against it, or MassDOT, as a result of a local, state, or federal enforcement action due to non-compliance with the CGP, the Contractor shall take full responsibility.

The NPDES CGP requires the submission of a Notice of Intent (NOI) to the EPA prior to the start of construction (defined as any activity which disturbs land, including clearing and grubbing). There is a 14 day review period commencing from the date on which EPA enters the Notice into their database. The Contractor is advised that, based on the review of the NOI, EPA may require additional information, including but not limited to, the submission of the Storm Water Pollution Prevention Plan (SWPPP) for review. Work may not commence on the project until final authorization has been granted by EPA. Any additional time required by EPA for review of submittals will not constitute a basis for claim of delay.

In addition, if the project discharges to an Outstanding Resource Water, vernal pool, or is within a coastal ACEC as identified by the Massachusetts Department of Environmental Protection (DEP), a separate notification to DEP is required. DEP may also require submission of the Storm Water Pollution Prevention Plan for review and approval. Filing fees associated with the notification to DEP and, if required, the SWPPP filing to DEP shall be paid by the Contractor.

The CGP also requires the preparation and implementation of a SWPPP in accordance with the aforementioned statutes and regulations. The Plan will include the CGP conditions and detailed descriptions of controls of erosion and sedimentation to be implemented during construction. It is the responsibility of the Contractor to prepare the SWPPP to meet the requirements of the most recently issued CGP. The Contractor shall submit the Plan to the Engineer for approval at least 4 weeks prior to any site activities. It is the responsibility of the Contractor to comply with the CGP conditions and the conditions of any state Wetlands Protection Act Order, Water Quality Certification, Corps of Engineers Section 404 Permit and other environmental permits applicable to the project and to include in the SWPPP the methods and means necessary to comply with applicable conditions of said permits (reference to Part 9.1.1 of the 2012 CGP).
It is the responsibility of the Contractor to complete the SWPPP in accordance with the EPA CGP, provide all information required, and obtain any and all certifications as required by the CGP. Any amendments to the SWPPP required by site conditions, schedule changes, revised work, construction methodologies, and the like are the responsibility of the Contractor. Amendments will require the approval of the Engineer prior to implementation.

Included in the CGP conditions is the requirement for inspection of all erosion controls and site conditions on a weekly basis as well as after each incidence of rainfall exceeding 0.25 inches in twenty-four hours. For multi-day storms, EPA requires that an inspection must be performed during or after the first day of the event and after the end of the event. The CGP requires that inspections be performed by a qualified individual. MassDOT requires proof of completion of a 4 hour minimum sedimentation and erosion control training class current to the latest CGP. This individual can be, but not limited to, someone that is either a certified inspector, certified professional, or certified storm water inspector. The documentation shall be included as an appendix in the SWPPP. The Engineer must approve the contractor's inspector. This individual shall be on-site during construction to perform these inspections. In addition, if the Engineer determines at any time that the inspector's performance is inadequate, the Contractor shall provide an alternate inspector. Written weekly inspection forms, storm event inspection forms, and Monthly Summary Reports must be completed and provided to the Engineer. Monthly Summary Reports must include a summary of construction activities undertaken during the reporting period, general site conditions, erosion control maintenance and corrective actions taken, the anticipated schedule of construction activities for the next reporting period, any SWPPP amendments, and representative photographs.

The Contractor is responsible for preparation of the Plan, all SWPPP certifications, inspections, reports and any and all corrective actions necessary to comply with the provisions of the CGP. Work associated with performance of inspections is not included under this Item. The Standard Specifications require adequate erosion control for the duration of the Contract. All Control measures must be properly selected, installed, and maintained in accordance with manufacturer specifications and good engineering practices. If periodic inspections or other information indicates a control has been used inappropriately or is no longer adequate, it is the responsibility of the Contractor to replace or modify the control for site conditions at no additional cost to the Department. The Contractor must maintain all control measures and other protective measures in effective operating condition and shall consider replacement of erosion controls for each construction season.

This Item addresses acceptable completion of the SWPPP, any revisions/amendments required during construction, and preparation of monthly reports. In addition, any erosion controls beyond those specified in bid items elsewhere in this contract which are selected by the Contractor to facilitate and/or address the Contractor's schedule, methods and prosecution of the work shall be considered incidental to this item.

The Contractor is advised The CGP provides specific requirements for temporary and final stabilization. This shall be incorporated into the project schedule. The permit defines specific deadline requirements for Initial Stabilization ("immediately", i.e., no later than the end of the next work day following the day when earth-disturbing activities have temporarily or permanently ceased) and for Complete Stabilization Activities (no later than 14 calendar days after the initiation of stabilization). Stabilization criteria for vegetative and non-vegetative measures are provided in the CGP.

The CGP requires the submission of a Notice of Termination (NOT) from all operators when final stabilization has been achieved, as well as removal and proper disposal of all construction materials, waste and waste handling devices, removal of all equipment and construction vehicles, removal of all temporary stormwater controls, etcetera. Approval of final stabilization by the Engineer and confirmation of submission of the NOT will be required prior to submission of the Resident Engineer's Final Estimate. The permittee is required to use EPA's electronic NOI system or "eNOI system" to prepare and submit NOT. The electronic NOT form can be found at www.epa.gov/npdes/stormwater/cgpenoi. If you are given approval by the EPA Regional Office to use a paper NOT, you must complete the form in Appendix K of the 2012 CGP.

Payment for all work under this Item shall be made at the Contract lump sum bid, which sum shall include all work detailed above, including plan preparation, required revisions, revisions/addenda during construction, monthly reports and filing fees.

Payment for all work detailed above, including Plan preparation, required revisions, revisions/addenda during construction, and monthly reports are included in the Lump Sum for this Item. Upon final acceptance of the SWPPP, a payment equal to 50% of the Contract Lump Sum price shall be paid. Payment of 40% of the Contract Sum shall be paid in 10% increments distributed equally throughout the remaining period of the Contract, not including extensions of time. Payment of the final 10% of the contract sum shall be paid upon satisfactory submissions of a Notice of Termination (NOT) when final stabilization has been achieved.

ITEM 761.1 SOIL MIX – A CUBIC YARD

This work shall consist of furnishing and installing Soil Mix “A”, as shown on the plans and in accordance with these specifications or as directed by the Engineer. Soil Mix A shall be a structural type of soil designed to adequately support rigid pavement systems while providing a subsurface environment of open pore space for water retention and tree roots growth paths.

Typical locations for Soil Mix “A” are tree planting areas under brick or cement concrete sidewalks where Modular Soil Cells cannot be installed and at excavation backfill areas at edges of Modular Soil Cells.

SUBMITTALS

Submit the following samples and submittals for approval in conformance with the requirements of this Section.

All testing and analysis shall be at the expense of the Contractor.

1. Loam for use in manufacturing Planting Soil Mix shall be sampled and tested in accordance with the following:

   The Contractor shall provide a one cubic foot representative sample from each proposed source of Loam, and organic amendment for testing, analysis, and approval. Additionally, the Contractor shall provide one cubic foot representative samples of Planting Soil Mix delivered to the site and stockpiled for use. Samples from on-site stockpiles of these three soil materials shall be taken as directed by the Engineer and packaged in the presence of the Engineer.

   The Contractor shall deliver all samples to testing laboratories and shall have the testing report sent directly to the Engineer. Tests for gradation, organics, soil chemistry and pH shall be performed by a soil testing agency recommended by the University of Massachusetts Extension Program and approved by the Engineer and Department. Test reports shall include the following tests and recommendations.

   a. Sieve analysis shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by ignition. The silt and clay content shall be determined by a hydrometer test of soil passing the #200 sieve. To facilitate review and approval of sieve analysis, provide a computer-generated gradation curve from UMASS Soil & Plant Tissue Laboratory.

   b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test Samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.

c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH). Nutrient levels shall be measured in parts per million (PPM). A Conductance Meter shall be used to measure Soluble Salt levels in soils: water extracts.

d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular planting objectives noted.

e. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists.

Contractor shall submit one-pound samples of loam and soil additives and five-pound samples of all stone. Samples should be labeled to include the location of the source of the materials.

MATERIALS

Loam: **Please note the loam for all three soil mixes has the same requirements and the Contractor may use the same submittals for all three items (provided the loam used comes from the same source).**

Shall be "fine sandy loam" or "sandy loam" determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System". Loam shall have the following mechanical analysis:

Textural Class	% of Total Weight	Avg%
Sand (0.05 - 2.0 mm dia. range)	45 - 75	60
Silt (0.002-0.05 mm dia. range)	20 - 40	30
Clay (less than 0.002 mm dia. range)	5 - 15	10

Shall contain not less than 5 1/2 percent nor more than 10 percent organic matter as determined by the loss on ignition of oven-dried samples. The loam shall have an acidity range of 5.5 pH to 7.6 pH.

Shall be free of debris and other extraneous matter. It shall be uncontaminated by saltwater, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millimhos/cm. (Test minus sieve #10 material). Soils shall not have levels of extractable aluminum greater than 200 parts per million.

Crushed Stone: Shall meet the requirements of M20.15 (Crushed Stone) as specified in MassDOT's Standard Specifications for Highways and Bridges and shall conform to M20.15 for the stone size.

Landscape Filter Fabric: Shall be non-biodegradable, non-woven, one hundred percent (100%) polypropylene fabric. The color shall be black. Shall conform to the following minimum specifications:

Grab Tensile Strength (lbs.) ASTM D 1682	110
Grab Elongation (90) ASTM D 1682	65
Trapezoid Tear Strength (lbs.) ASTM D 2263	50
Mullen Burst Strength (PSI) ASTM D 3786	250
Punctured Strength (lbs.) ASTM D 751	70
Coefficient of Permeability (cm/sec.)	0.10 - 0.30
Equivalent Opening Size US STD. Sieve	70-100

Water Retention Agent: Shall be a potassium propenoate-propenamide copolymer, Hydrogel or approved equal.

METHOD OF CONSTRUCTION

Mixing and Testing:

All mixing shall be performed using appropriate soil mixing equipment of sufficient capacity and capability to assure quality control. No mixing of soils at the project site shall be permitted unless suitable portable equipment is approved by the Engineer. The Contractor shall mix sufficient material in advance of the time needed at the job site to allow adequate time for testing as required by the progress of the work.

For each stockpile, not less than two samples of Soil Mix A weighing not less than ten pounds, shall be collected for every 100 cubic yards of material produced. In the event that the average stone-loam ratio varies significantly from the approved sample, as determined by the Engineer, the Contractor shall make adjustments to the mixing ratios and procedures. Re-mix and re-test any lot of soil that fails to meet the correct analysis after the adjustment has been made.

After completion of the mixing and prior to the installation, protect the Soil Mix A stockpile from rain and mix separation through erosion. The stockpile shall be covered at all times with tarps or store in a covered structure.

Mixing Protocol:

Conventional techniques for mixing concrete are not acceptable for Soil Mix A. The Contractor shall use ground mixing with front-end loaders to provide the desired blend.

Loam and stone shall be mixed to the following proportions:

Component	**by units of weight**
Stone	80%
Soil	20%

Remote mixing and storage in a dryer state and hydration after placement is acceptable.

Delivery, Storage, and Handling:

Soil Mix A shall be delivered at or near optimum compaction moisture content as determined by AASHTO T99/ASTM D698. Do not deliver or place materials in an excessively moist condition (beyond two percent above optimum compaction moisture content as determined by AASHTO T99/ASTM D6948).

Do not allow Soil Mix A to be unprotected from large rainfall events. Do not allow excess water to enter the site prior to compaction (washing of tools, trucks, etc.). If water is introduced into the material after grading, allow material to drain to near optimum compaction moisture content. Do not deliver or place materials in frozen condition.

Placing Soil MixA:

All areas to receive Soil Mix A shall be excavated to the depth specified on the plans and free of construction debris, refuse, compressible or decayable materials and standing water. Furnish and install Soil Mix A in designated areas. Add water retention agent to Soil Mix A at the site. Water retention agent shall be spread and worked into the soil mix at a rate of 1 pound per cubic yard of soil mix. Do not place Soil Mix A when materials are frozen or wet.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Soil Mix "A" (Item 761.1) shall be paid for at the Contract Unit Price per Cubic Yard installed and measured in-place including all excavation, blending, testing, amendments, placement, scarification, compaction, grading, labor, materials and equipment required for the satisfactory completion of the work.

Excavation for soil mix will be paid under 120.1 Unclassified Excavation.

ITEM 761.2 SOIL MIX – B CUBIC YARD

This work shall consist of furnishing and installing Soil Mix "B", as shown on the plans and in accordance with these specifications or as directed by the Engineer. Typical locations for Soil Mix "B" are plant beds and landscaped areas.

SUBMITTALS

Submit the following samples and submittals for approval in conformance with the requirements of this Section.

All testing and analysis shall be at the expense of the Contractor.

1. Loam for use in manufacturing Planting Soil Mix shall be sampled and tested in accordance with the following:

   The Contractor shall provide a one cubic foot representative sample from each proposed source of Loam, and organic amendment for testing, analysis, and approval. Additionally, the Contractor shall provide one cubic foot representative samples of Planting Soil Mix delivered to the site and stockpiled for use. Samples from on-site stockpiles of these three soil materials shall be taken as directed by the Engineer and packaged in the presence of the Engineer.

   The Contractor shall deliver all samples to testing laboratories and shall have the testing report sent directly to the Engineer. Tests for gradation, organics, soil chemistry and pH shall be performed by a soil testing agency recommended by the University of Massachusetts Extension Program and approved by the Engineer and Department. Test reports shall include the following tests and recommendations.

   a. Sieve analysis shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by ignition. The silt and clay content shall be determined by a hydrometer test of soil passing the #200 sieve. To facilitate review and approval of sieve analysis, provide a computer-generated gradation curve from UMASS Soil & Plant Tissue Laboratory.

   b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test Samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.

   c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH). Nutrient levels shall be measured in parts per million (PPM). A Conductance Meter shall be used to measure Soluble Salt levels in soils: water extracts.

   d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular planting objectives noted.

e. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists.

Contractor shall submit one-pound samples of loam and soil additives and five-pound samples of all stone. Samples should be labeled to include the location of the source of the materials.

QUALIFICATIONS

Soil mixes shall be supplied by a firm that specializes in the production of mixes of planting soils and have at least 5 years' experience in providing blended soil mixes to projects of similar size and scope to this Work.

MATERIALS

Soil Mix "B" shall be a 4:1 blend of Loam (4) and Manufactured Compost (1).

Loam:

Shall be "fine sandy loam" or "sandy loam" determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System". Loam shall have the following mechanical analysis:

Textural Class	**% of Total Weight**	**Avg%**
Sand (0.05 - 2.0 mm dia. range)	45 - 75	60
Silt (0.002-0.05 mm dia. range)	20 - 40	30
Clay (less than 0.002 mm dia. range)	5 - 15	10

Shall contain not less than 5 1/2 percent nor more than 10 percent organic matter as determined by the loss on ignition of oven-dried samples. The loam shall have an acidity range of 5.5 pH to 7.6 pH.

Shall be free of debris and other extraneous matter. It shall be uncontaminated by saltwater, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millimhos/cm. (Test minus sieve #10 material). Soils shall not have levels of extractable aluminum greater than 200 parts per million.

No quantity of Soil Mix B shall be delivered to the site until the review and approval of loam test results by the Engineer, but such approval shall not constitute final acceptance. The Engineer will reject any material delivered to the site which, after on-site, post-delivery testing, does not meet these specifications.

Organic Amendment Materials (Compost):

1. Compost for amending planting media shall be a stable, humus-like material produced from the aerobic decomposition of organic residues. The residues, if biosolids, shall consist of compost meeting the required criteria as listed herein this Section or approved equal. The compost shall be a dark brown to black color and be capable of supporting plant growth with appropriate management practices in conjunction with addition of fertilizer and other amendments as applicable, with no visible free water or dust, with no unpleasant odor, and meeting the following criteria as reported by the producer.

   The ratio of carbon to nitrogen shall be in the range of 10:1 to 25:1.

   a. Stability shall be assessed by either a CO2 evolution test, a re-heating test, or the Solvita procedure. Protocols for each are specified by the coalition of Northeastern Governors Source Reduction Task Force (CONEG) in their 1966 report, "Model Procurement

Specifications for Source Separated Compost." and the Solvita manual (version 3.5). For the CO2 test, the compost respiration shall be no more than 6 mg CO2-C/gBVS day. For reheating using the Dewar self-heating test, the maximum heat rise shall be no greater than 48 degrees F above room temperature (68 to 77 degrees F). For the Solvita test, the compost must achieve a maturity index of 6 or more. Stability tests shall be conducted by Woods End Research Laboratory, Mt. Vernon, Maine.

b. Pathogens/Metals/Vector Attraction reduction shall meet 40 CFR Part 503 rule, Table 3, page 9392, Vol. 58 No. 32, and Commonwealth of Massachusetts 310 CMR 32.00 (for applications to soils with human activity).

c. Organic Content shall be at least 40 percent (dry weight). One hundred percent of the material shall pass a 3/8-inch (or smaller) screen. Debris such as metal, glass, plastic, wood (other than residual chips), asphalt or masonry shall not be visible and shall not exceed one percent dry weight. Organic content shall be determined by weight loss on ignition for particles passing a number 10 sieve according to procedures performed by a soil testing agency recommended by the Ohio State University Extension Program and approved by the Landscape Architect and Department. A 3 cubic inch sub-sample of the screened and mixed compost is ground to pass the number 60 sieve. 0.07 to 0.10 ounces of ground sample, dried to a constant weight at 221 degrees F is placed into a muffle furnace. The temperature is slowly raised (41 degrees F/minute) to 842 degrees F and maintained for three hours. The sample is removed toan oven to equilibrate at 224F and the weight is taken. Organic matter is calculated as loss on ignition.

d. PH: The pH shall be between 5.5 to 8.0 as determined from a 1:1 soil-distilled water suspension using a glass electrode pH meter American Society of Agronomy Methods of Soil Analysis, Part 2, 1986.

e. Salinity: Electrical conductivity of a one to two soil to water ratio extract shall not exceed 2.0 mmohs/cm (dS/m).

f. The compost shall be screened to 3/8 inch maximum particle size and shall contain not more that 3 percent material finer that the 200 Sieve as determined by hydrometer test on ashed material.

g. Nutrient content shall be determined by the University of Massachusetts Soil Testing Laboratory or equivalent laboratory and utilized to evaluate soil required amendments for the mixed soils. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, Aluminum, Magnesium, Iron, Manganese, Lead, Soluble Salts, Cation Exchange Capacity, soil reaction (pH), and

METHOD OF CONSTRUCTION

Incorporate soil amendments thoroughly into loam, per recommendations of test reports, to meet the specified characteristics for loam. Soil Mix B shall be a thoroughly blended 4:1 mix of Loam (4) and Compost (1).

Placing and Compacting Soil Mix B:

All areas to receive Soil Mix B shall be free of construction debris, refuse, compressible or decayable materials and standing water. The contractor shall excavate the area to receive the Soil Mix to a depth of 24”.

Place Soil Mix “B” to a finished depth equal to 4” below the top of the Granite curb and to the grade of the existing soil at any edges designated to remain. Do not place Soil Mix B when materials are frozen.

Avoid any over-compaction of existing soils or new fills which would be detrimental to planting objectives. If observed any noted issue shall be corrected by excavating, tilling or other means and then re-placing the line and grade required at no additional cost.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT
Soil Mix "B" (Item 761.2) shall be paid for at the Contract Unit Price per Cubic Yard installed and measured in-place including all excavation, screening, Manufactured Compost, testing, amendments, placement, scarification, compaction, grading, labor, materials and equipment required for the satisfactory completion of the work.

Excavation for soil mix will be paid under 120.1 Unclassified Excavation.

ITEM 761.3 SOIL MIX – C CUBIC YARD

Provide all materials, equipment and labor necessary to complete the work in connection with furnishing, and delivery of planting soil and /or the modification of existing site soil for use as planting soil within the Modular Soil Cell system.

SUBMITTALS
Submit the following samples and submittals for approval in conformance with the requirements of this Section.

All testing and analysis shall be at the expense of the Contractor.

1. Loam for use in manufacturing Planting Soil Mix shall be sampled and tested in accordance with the following:

   The Contractor shall provide a one cubic foot representative sample from each proposed source of Loam, and organic amendment for testing, analysis, and approval. Additionally, the Contractor shall provide one cubic foot representative samples of Planting Soil Mix delivered to the site and stockpiled for use. Samples from on-site stockpiles of these three soil materials shall be taken as directed by the Engineer and packaged in the presence of the Engineer.

   The Contractor shall deliver all samples to testing laboratories and shall have the testing report sent directly to the Engineer. Tests for gradation, organics, soil chemistry and pH shall be performed by a soil testing agency recommended by the University of Massachusetts Extension Program and approved by the Engineer and Department. Test reports shall include the following tests and recommendations.

   a. Sieve analysis shall be performed and compared to the USDA Soil Classification System. Sieve analysis shall be by combined hydrometer and wet sieving using sodium hexametaphosphate as a dispersant in compliance with ASTM D 422 after destruction of organic matter by ignition. The silt and clay content shall be determined by a hydrometer test of soil passing the #200 sieve. To facilitate review and approval of sieve analysis, provide a computer-generated gradation curve from UMASS Soil & Plant Tissue Laboratory.
   b. Percent of organics shall be determined by the loss on ignition of oven-dried samples. Test Samples shall be oven-dried to a constant weight at a temperature of 230 degrees F, plus or minus 9 degrees.

c. Chemical analysis shall be undertaken for Nitrate Nitrogen, Ammonium Nitrogen, Phosphorus, Potassium, Calcium, extractable Aluminum, Soluble Salts, and acidity (pH) and buffer (pH). Nutrient levels shall be measured in parts per million (PPM). A Conductance Meter shall be used to measure Soluble Salt levels in soils: water extracts.

d. Soil analysis tests shall show recommendations for soil additives to correct soils deficiencies as necessary, and for additives necessary to accomplish particular planting objectives noted.

e. All tests shall be performed in accordance with the current standards of the Association of Official Analytical Chemists.

MATERIALS

Loam:
Shall be "fine sandy loam" or "sandy loam" determined by mechanical analysis (ASTM D-422) and based on the "USDA Classification System". Loam shall have the following mechanical analysis:

Textural Class	**% of Total Weight**	**Avg%**
Sand (0.05 - 2.0 mm dia. range)	45 - 75	60
Silt (0.002-0.05 mm dia. range)	20 - 40	30
Clay (less than 0.002 mm dia. range)	5 - 15	10

Shall contain not less than 5 1/2 percent nor more than 10 percent organic matter as determined by the loss on ignition of oven-dried samples. The loam shall have an acidity range of 5.5 pH to 7.6 pH.

Shall be free of debris and other extraneous matter. It shall be uncontaminated by saltwater, foreign matter and substances harmful to plant growth. The electrical conductivity (EC2) of a 1:2 soil-water suspension shall be equal to or less than 1.0 millimhos/cm. (Test minus sieve #10 material). Soils shall not have levels of extractable aluminum greater than 200 parts per million.

METHOD OF CONSTRUCTION

At the time of soil installation, add fertilizer or biological amendments, if required, to the planting soil mix at rates recommended by the testing results for the plants to be grown.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Soil Mix “C” (Item 761.3) shall be paid for at the Contract Unit Price per Cubic Yard installed and measured in-place including all excavation, testing, amendments, placement, scarification, compaction, grading, labor, materials and equipment required for the satisfactory completion of the work.

ITEM 775.1 TREES EACH
ITEM 785.1 SHRUBS EACH
ITEM 795.1 PERENNIALS, ORNAMENTAL GRASSES & FERNS – 1 GALLON EACH
ITEM 795.2 PERENNIALS, ORNAMENTAL GRASSES & FERNS – 2 GALLON EACH

The work under these Items shall conform to the relevant Provisions of Section 771 of the Standard Specifications, except as amended and supplemented and as indicated on the drawings and as specified below.

Provide all materials, equipment and labor necessary to complete the work as indicated on the drawings or as specified herein. The plant list for the project is presented below.

TREES

Emerald Avenue Hornbeam	*Carpinus betulus 'Emerald Avenue'*	3.5"- 4" Caliper	B&B
Honey Locust	*Gleditsia tri. inermis 'Skycole'*	3.5"- 4" Caliper	B&B
Emerald City Tulip Tree	*Liriodendron tulipifera 'Emerald City'*	3.5"- 4" Caliper	B&B
Callery Pear	*Pyrus calleryana 'Chanticleer'*	3.5"- 4" Caliper	B&B
Japanese Zelkova	*Zelkova serrata 'Green Vase'*	3.5"- 4" Caliper	B&B
Slender Japanese Zelkova	*Zelkova serrata 'Musashino'*	3.5"- 4" Caliper	B&B

SHRUBS

Gold Cone Juniper	*Juniperus communis 'Gold Cone'*	5 gallon	
Dwarf English Yew	*Taxus baccata 'Amersfoort'*	2.5 – 3'	B&B
Hicks English Yew	*Taxus media 'Hicksii'*	3 – 3.5'	B&B

PERENNIALS, ORNAMENTAL GRASSES & FERNS – 1 GALLON

Tufted Hairgrass	*Deschampsia cespitosa 'Goldtau'*	1 gallon
Hayscented Fern	*Dennstaedtia punctilobula*	1 gallon
Bruce's White Creeping Phlox	*Phlox stolonifera 'Bruce's White'*	1 gallon
Angelina Sedum	*Sedum rupestre 'Angelina'*	1 gallon
Blue Spruce Sedum	*Sedum rupestre 'Blue Spruce'*	1 gallon

PERENNIALS, ORNAMENTAL GRASSES & FERNS – 2 GALLON

Foerster's Feather Reed Grass	*Calamagrostis 'Karl Foerster'*	2 gallon
Red Switchgrass	*Panicium virgatum 'Ruby Ribbons'*	2 gallon
Red Switchgrass	*Panicium virgatum 'Shenandoah'*	2 gallon
Little Blue Stem	*Schizachyrium scoparium 'Prairie Blues'*	2 gallon
Blue Ice Bluestar	*Amsonia 'Blue Ice'*	2 gallon
Eastern Purple Coneflower	*Echinacea purpurea*	2 gallon
White Swan Coneflower	*Echinacea purpurea 'White Swan'*	2 gallon
Foamflower	*Tiarella cordifolia 'Sugar and Spice'*	2 gallon

For the above Items the Contractor shall provide and install plant material of genus, species, variety, size and quantities in locations as directed by the Engineer. The work of this section includes, but is not limited to, the following:

- Purchasing and transporting plant material to construction sites
- Installation of plant material
- Plant care during 60-day Maintenance Period and one-year Establishment Period
- Replacement of defective or dead plants at End of Establishment Period

QUALIFICATIONS

Cooperation By Contractor (Supplementing Subsection 5.05):
The Landscape Contractor shall have five years continuous experience and expertise in management, handling and installation of ornamental plant material in large scale landscape construction projects. Site foreman shall have at least five years of experience and shall be on-site during all times of plant installation.

REFERENCES AND STANDARDS
The following standards shall apply to the Work of this Section.

ASNS: "American Standard for Nursery Stock," ANSI Z-60.1, latest edition, published by American Association of Nurserymen (AAN).

Manual of Woody Landscape Plants: Their Identification, Ornamental Characteristics, Culture, Propagation and Uses. Michael Dirr, Stipes Publishing Company, latest edition.

Tree and Shrub Transplanting Manual, E.B. Himelick, 1991, International Society of Arboriculture.

Pruning Standards: The "Standards for Pruning Shade Trees" of the National Arborist Association, 174 Route 101, Bedford, NH 03102.

Examination of Conditions:
The Contractor shall be responsible for judging the full extent of work requirements involved. This responsibility includes, but is not limited to, the following: transportation, purchase, temporary storage and maintenance of plants; plant rehandling prior to final installation; removal and off-site disposal of existing loam determined by the Engineer to be unacceptable; purchase, transport, and supply of Soil Mix.

SUBMITTALS
Plant Material: At least 120 days prior to anticipated planting, the Contractor shall submit a confirmation of availability for all plants on the list, accompanied by nursery sources. When the specified types and sizes of plants are not available, substitutions may be made upon request by the Contractor, if approved in writing by the Engineer. Substitutions proposed by the Contractor shall have equivalent overall form, height, and horticultural characteristics and must be approved in writing by the Engineer prior to tagging. At least 30 days prior to planting, the Contractor shall submit a proposed schedule for the inspecting and tagging of plant material in the nursery to the Engineer.

For all other materials, at least 30 days prior to ordering, the Contractor shall submit to the Engineer material specifications and (where applicable) installation instructions attesting that the following materials meet the requirements as specified. No materials shall be ordered until submittals have been approved by the Engineer. Delivered materials shall match the samples.

All material samples shall include supplier’s literature and certification that material meets specifications. Submittals, including samples, material specifications, and installation specifications are as follows

Soil wetting agent: Hydrogel or equivalent. Submit one-kilogram sample with supplier specifications and certification.

Fungal mychorrhizae: Submit sample with supplier specifications and certification.

Backfill Mix: The contractor shall utilize Soil Mix B as specified under Section 761.12 within landscaped areas and as backfill when installing plants.

Water: Submit a watering schedule, including sources of water, methods of irrigation, and any incidental work required to provide water for the plants.

Testing Methods: The Contractor shall submit to the Engineer for his inspection and approval, equipment and methods for testing soil moisture and soil pH.

The Contractor shall provide to the Engineer two new functioning moisture gauges, including instructions for use and batteries if required, for his use during the duration of the Contract. The meters shall be handheld and shall be capable of measuring moisture at a depth of 150 millimeters. Meter scale shall be sufficient to determine moist, dry, or wet soil. The meters shall be regularly checked for calibration against watered loam and shall be replaced if found faulty at no additional cost.

In addition, the Contractor shall provide to the Engineer one copy of the "American Standard for Nursery Stock," ANSI Z-60.1, latest edition, published by American Association of Nurserymen (AAN) for the duration of this Contract.

MATERIALS

Plant Materials:

The Contractor shall furnish all plants as shown on the plans, unless otherwise directed in writing by the Engineer. All plants shall be nursery grown.

All plants shall be legibly tagged with the botanical name. Only plant stock grown within hardiness Zones 1 through 6a, as established by the USDA Plant Hardiness Zone Map, will be accepted. The Contractor's suppliers must certify in writing that the stock has actually been grown to Zone 6a or hardier conditions. Plants not so certified will not be accepted.

All plants shall be typical of their species or variety in growth habit. Plant sizes, habit, root balls, and containers shall be in accordance with the American Standard for Nursery Stock (ASNS), Standards of the American Association of Nurserymen (AAN) as a minimum requirement for acceptance.

All plants must be moved with the root systems in soil. Balled and burlapped plants shall be wrapped with untreated 225-gram (8 ounce) burlap, firmly held in place by a stout cord. Wire containers shall be of sufficient size to allow root development for the plant size, per ASNS requirements. Plants prepared with plastic or other non-biodegradable wrappings will not be accepted. Root balls shall remain intact during all operations. No plant will be accepted if the root ball has been badly cracked or broken prior to, or during, the process of planting. Root balls shall be moist upon arrival and shall be kept moist until installation. All balled and burlapped plants that cannot be planted at once must be heeled in by setting them in the ground, covering the root balls with soil, and watering them adequately.

Container-grown stock shall have been grown in the container long enough for the root system to have developed sufficiently to hold its soil together firmly. No plants shall be loose in the container. Container-grown plants shall not be pot bound, with spiraling roots or roots growing densely against the sides of the container. Score or butterfly cut root ball of all container-grown plants prior to planting.

Each plant shall have plenty of fibrous roots, healthy buds, and shall be free of disease or insect pests, eggs or larvae. All plant parts shall show active green cambium when cut. They shall be densely foliated when in leaf.

The trunk of each tree shall be free from sun scald, frost cracks, or wounds resulting from abrasions, fire or other causes. Pruning wounds shall be no larger than 2 inch and shall show vigorous scar tissue. No trees with double-leaders or twin-heads will be acceptable without the written approval of the Engineer. No plant material from cold storage will be accepted. In regards to shrubs, no single stemmed or thin plants will be accepted. The side branches must be generous and well-twigged, and the plant as a whole must be well-branched to the ground. The plants must be in a vigorous condition, free from dead wood, bruises or other root or branch injuries.

Planting Soil Mix:
Identified in the plans, as Soil Mix B planting soil for backfill shall be a mixture of equal parts approved loam and excavated material. Mixed material shall be pH tested by the Contractor in the presence of the Engineer, and adjusted according to particular planting applications, using lime or sulfur as required. For plants that require an acid soil, such as ericaceous plants and broad-leaved evergreens, planting soil shall have a true pH of 4.5 to 5.5. Planting soil for all other plants shall have a true pH value of 6.0 to 6.5. Proposed soil amendments shall be submitted to the Engineer for approval prior to application.

Bark Mulch:
Bark mulch shall be shredded pine bark aged a minimum of six (6) months. The mulch shall be dark brown in color, free of chunks and pieces of wood thicker than ¼ inch and shall not contain, in the judgement of the Engineer, an excess of fine particles. Unless otherwise specified in these special provisions, bark mulch shall be incidental to the cost of the planting items. Do not use wood chips.

Water:
The Contractor shall be responsible for furnishing his own supply of water to the site at no extra cost. All plants injured or damaged due to the lack of water, or due to the use of too much water, shall be the Contractor's responsibility to correct. Water shall be free from impurities injurious to vegetation.

Soil Wetting Agent:
Soil Wetting Agent shall be a synthetic, non-toxic acrylic polyacrylamide or natural soluble plant extract. Application rates shall be per manufacturer’s recommendations.

Fungal Mycorrhizae:
Each plant shall be planted with fungal mycorrhizae. Mycorrhizae shall include at least three species of vesicular arbuscular (endomycorrhizal) fungi as well as ectomycorrhizal fungi. Mycorrhizae shall be shipped in individual dosage packets.

METHOD OF CONSTRUCTION
Furnishing and planting of plant material shall include, but is not limited to, the following: digging of the pits and plant beds; amendment of loam as required to produce planting soil mix; provision of soil additives for pH requirements of specific plants; provision of soil wetting agents; provision of mycorrhizal fungi; furnishing the plants as specified; plant installation; watering and maintenance.

Seasons for Planting:

Spring:	Deciduous materials - March 21 through May 1
	Evergreen materials - April 15 through June 1
Fall:	Deciduous materials - Oct. 1 through Dec. 1
	Evergreen materials - Aug. 15 through October 15

Requests for exceptions to this schedule shall be submitted in writing to the Engineer for approval. Engineer may request additional maintenance, watering, etc. if material is planted out of season.

Plant Tagging and Approval:
The Contractor shall locate, secure, tag, and ship plant material in a sufficiently timely manner to ensure minimal substitution and storage of plants.

Plants shall be tagged at least one month prior to the expected planting date. The Contractor shall be responsible for tagging the material at the nursery and providing a representative. The Contractor shall request that the Engineer provide a representative to approve tagged stock to be planted under this Section. Contractor shall tag or allow the nursery to tag material for approval of the Engineer's representative. In the event that satisfactory material cannot be located, the Contractor shall be responsible for any necessary travel and overnight accommodations for the Engineer's representative during the period of time required to locate, select, and approve plant material.

All trees and a representative sample of each shrub species on the Plant List shall be tagged by the Contractor at the nursery and approved by the Engineer or his representative, prior to digging, for conformity to specification requirements as to quality, size, and variety. Cost of replacement of materials rejected by the Engineer at the site shall be borne by the Contractor.

Approval of tagged material at the nursery shall not prevent the right of inspection and rejection upon delivery at the site or during the progress of the work.

Tree trunks shall be protected during shipping by a heavy walled cardboard sleeve or other suitable material. Plants shall either be shipped in enclosed trucks or all surfaces, leaves and branches shall be wrapped to prevent damage and desiccation.

Plant Delivery and Installation:
Locations for all plants shall be approved by the Engineer before any plant pits or plant beds are dug.

The Contractor shall locate all underground utilities within 4 meters of the proposed planting pits and notify the Engineer of any conflicts prior to digging plant pits.

The Contractor shall notify the Engineer 3 working days prior to the proposed arrival of plant material on the site. All plants shall be planted within 5 days of arrival on site or shall be rejected by the Engineer. Plants stored on site shall be shaded from direct sunlight at all times and shall not be stored on paved surfaces. Plants stored on site shall be watered daily.

Planting:
Prior to the installation of any plant material, the Contractor shall dig test pits to determine percolation rates. Percolation of less than 1 inch per hour shall require corrective measures as recommended by the Contractor and approved by the Engineer.

Plant pits shall be excavated as shown on plans and the sides scarified to prevent glazed soils.

Trees and shrubs shall be placed as shown on the plans, with the root crown exposed above finished grade. After placement of balled and burlapped plants and prior to backfilling, remove all rope, wire baskets and burlap from the root balls. For container material, remove pots just before planting, and loosen the perimeter roots and soil before placement. Handle plants carefully to prevent damaging roots or stems.

Add soil wetting agent and mycorrhizal fungi per manufacturer specifications. After planting, the Contractor shall submit wetting agent and fungi dose packets to the Engineer to certify installation of material.

Prepare planting soil mix as specified above to depths as shown on the drawings. Place backfill mix in layers of not more than 6 inches, and water each layer sufficiently to settle soil before the next layer is put in place. Backfill mix shall meet finished grade after settlement. Shape edge of planting pit to form a saucer for holding water and place mulch as shown in the plans. Do not cover the stem flare of the plants with mulch.

Water plants immediately following planting as necessary to thoroughly moisten root ball and planting soil.

Plants shall not be wrapped after installation. Wounds shall not be painted. Trees shall not be staked unless wind or other local conditions require the additional protection. Staking and guying shall be incidental to tree installation. Use cloth tape rather than wire. The Contractor shall be responsible for removing all staking and guying materials at the end of the Maintenance Period.

Plant Care:
Contractor shall provide plant care for the duration of the Maintenance and Establishment periods

Adequate watering is essential to plant care. During the 60-day Maintenance Period, plants shall be inspected for watering needs at least twice each week using moisture meters supplied by the Contractor. In addition, during the portion of the Establishment period occurring between May 1 and October 1, the plants shall be inspected weekly using moisture meters.

Plant care shall consist of keeping the plants in a healthy growing condition. Plant care shall include watering, weeding, pruning, re-mulching, removal of dead material, resetting plants to proper grades or upright position, and maintaining the planting saucer.

Trees and shrubs shall be pruned, if necessary, following planting and in accordance with the American Nurserymen's Association Standards for Class I, fine pruning, to preserve the natural character of the plant. All dead wood or suckers and all broken or badly bruised branches shall be removed. Do not cut leaders. The Engineer shall determine if plants require pruning or should be rejected. All pruning work shall be done by a Massachusetts Certified Arborist.

Any decline in the condition of new plantings shall require the Contractor to take immediate action to identify potential problems and undertake corrective measures. If required, the Contractor shall engage professional arborists and/or horticulturists to inspect plant materials and to identify problems and recommend corrective procedures. The Engineer shall be immediately advised of such actions. Inspection and recommendation reports shall be submitted to the Engineer.

Absolutely no debris may be left on the site. The Contractor shall repair any damage to site as directed by the Engineer, at no additional cost.

Maintenance Period: 60 Days:
The Maintenance Period shall begin immediately after each plant is planted and shall continue for a minimum of 60 days following the completion of all planting installations, or until the Conditional Acceptance of all planting work, whichever is a longer period of time.

At the end of the Maintenance Period, the Contractor will request inspection by the Engineer at least 10 days before the anticipated date of inspection.

At the time of inspection, if the plant materials and workmanship are acceptable to the Engineer, the Engineer shall issue a written Certificate of Conditional Acceptance to the Contractor. The date of the inspection shall establish the end of the Maintenance Period and the commencement of the required one-year establishment period for planting work.

If in the Engineer's opinion, plant materials and/or workmanship is deficient, acceptance will not be granted, and the Maintenance Period for all the plants shall be extended until plant replacements are made or other deficiencies are corrected. All dead and unsatisfactory plants shall be removed promptly from the project. Replacement plants shall conform in all respects to the Specifications for the original plants and shall be planted in the same manner.

Establishment Period: One Year from Conditional Acceptance:
The purpose of the Establishment Period is to establish healthy, vigorously growing plants. The Contractor shall establish the plantings through a full growing season and a full winter. Plants will be inspected by the Engineer twice after Conditional Acceptance. The Contractor is responsible for arranging inspection early enough in the season to allow adequate time to procure and install replacement material.

Any issues related to physical damage to the plants shall be identified to the Engineer in advance of any walk-thru inspection and shall be provided in writing. Conditions arising from un-anticipated natural weather events such as hurricanes or ice storms shall be observed, inventoried and furnished in written format within 72 hours after the event.

At the end of the Establishment Period, each plant shall show healthy growth on at least 75 percent of its terminal stems, as determined by the Engineer. Determination of healthy growth shall include, but is not necessarily limited to, viable leaves (in season) and terminal buds, as well as live cambium. Plants found to be unacceptable shall be removed promptly from the site and replaced immediately or during the next normal planting season, as permitted by the specifications.

Newly planted areas shall be free of weeds and debris, and plantings shall be re-mulched as necessary.

The Engineer will inspect the replacement planting work upon the request of the Contractor. Request for inspection shall be received by the Engineer at least ten days before the anticipated date of inspection.

Stakes and guying, if any, shall be removed from all plants before Final Acceptance.

Upon acceptance of the work of replacement planting, the Engineer shall issue a written Certificate of Final Acceptance for all plants installed under this Section to the Contractor.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for planting of trees, shrubs, perennials, ornamental grass, and ferns shall be made at the Contract Unit Prices bid per Each. Payment will not be approved until satisfactory completion of the Maintenance Period. The Contract unit prices paid shall be full compensation for providing materials, equipment, labor, and incidentals to provide plant pit excavation, soil preparation, soil amendments, planting mix preparation, loam for planting mix, soil wetting agents, mycorrhizal fungi planting, plant protection, bark mulch (including placement), watering, maintenance, disposal of unsuitable soils, and all other incidentals required for furnishing and installing the plantings in accordance with the drawings, and as directed by the Engineer.

ITEM 804.1 1 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC -(UL) FOOT

ITEM 804.2 2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) FOOT

ITEM 804.22 2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC- (UL) (DOUBLE) FOOT

ITEM 804.23 2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (3 BANK) FOOT

ITEM 804.24 2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (4 BANK) FOOT

ITEM 804.25 2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (5 BANK) FOOT

ITEM 804.28 2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (8 BANK) FOOT

ITEM 804.212 2 INCH ELECTRICAL CONDUIT TYPE NM - PLASTIC (UL) (12 BANK) FOOT

ITEM 804.3 3 INCH ELECTRICAL CONDUIT TYPE NM – PLASTIC - (UL) FOOT

The work under these Items shall conform to the relevant provisions of Section 804 of the Standard Specifications and the following:

Conduit, whether shown on the plans or additional lengths placed as directed by the Engineer, may be increased or decreased by the Engineer depending upon actual conditions encountered, as provided for in Section 4.06 of the Standard Specifications. These conduits are for the street lighting system.

All conduit material for traffic signal, lighting or in roadway shall be Schedule 80 Polyvinyl Chloride (PVC) plastic and shall meet the requirements of UL 651 and NEMA TC-2. Conduit material shall be Schedule 40 Polyvinyl Chloride (PVC) plastic for general application for lighting under sidewalk. Conduit shall be manufactured by American Pipe and Plastic or approved equal.

The Contractor shall make efforts to install parallel conduits in the same trench.

The Contractor shall make efforts to install parallel conduits in the same trench. However, in the case of multiple conduits/utilities in a trench, a 12” clear width shall be provided between communication conduit and electric conduit. All road crossings shall be as perpendicular as possible to the centerlines of the road as shown on the plans.

Conduit backfill and surface restorations shall be in accordance with the details shown on the plans.

The depth of conduit may need to be deeper than the typical excavation depth to avoid conflicts with these existing utilities. The work under these Items shall include these field adjustments.

Conduit under Sidewalk, Median or Driveways

Where conduit is installed in a sidewalk, paved median or asphalt driveway areas, no separate payment shall be made for the saw-cutting, excavation, and sand bedding, gravel backfill, including necessary compaction, or incidental materials, but all costs in connection therewith shall be included in the contract unit price for these items.

Conduit Crossing Roadways and future use

The existing pavements shall be sawcut through their full depth and the pavement removed. The conduit for future use shall be installed along the curb line in the pavement for both sides of the roadway for the entire length of the project as directed by the Engineer.

After conduit installation, the trench shall be backfilled with controlled density-fill (CDF). CDF shall be Type 2E as directed, confirming to the requirements of Section M4.08.0 of the Standard Specifications. The finished grade of the CDF shall be below existing pavement surface as shown on the construction details.

Payment under these Items shall be at the Contract Unit Prices bid per Foot for furnishing and installing approved conduit of the appropriate size and type, which price shall be full compensation for all necessary or incidental work including saw-cutting, excavation, pull wire, warning strip, sand bedding, forming and providing CDF encasement in case for roadway crossing, backfilling and compaction complete in place. Multiple conduits in the same trench shall be compensated for as noted above. Required sweeps shall be measured for payment under this Item including galvanized sweeps, where required.

Temporary pavement for surface restoration to match the existing surface, where required shall be paid under Item 472, Temporary Asphalt Patching.

If required gavel borrow for backfill shall be paid under Item 151.

The Controlled density fill (CDF) and shall be paid for under Item 153.

ITEM 811.23 ELECTRIC HANDHOLE - SD2.023 EACH
ITEM 811.31 PULL BOX 12 X 12 INCHES - SD2.031 EACH

Work under these Items shall conform to the relevant provisions of Section 801 of the Standard Specifications and the following:

The work shall include furnishing and installing pullboxes and electric handholes for traffic signal in accordance with the plans and as directed by the Engineer.

All pull boxes shall be a pre-cast concrete with cast iron covers. The top of all pull boxes shall be set flush with the finish grade. The pullboxes and electrical handholes shall be left free and clear of any foreign matter.

The bottom elevation of any pull box or electric handhole shall not be greater than 30-inches below the top finish grade elevation of the cast iron cover.

METHOD OF MEASUREMENT

The items listed above will be measured for payment per each, complete in place.

BASIS OF PAYMENT

Handholes and pull boxes shall be paid for at the Contract Unit Price bid per Each, which price shall be full compensation for all labor, materials, equipment and incidental costs required to complete the handhole and pull box installation. No separate payments will be made for excavation, sawcutting, gravel borrow backfill, leveling the frame and cover, compaction and temporary restoration of surface features.

ITEM 811.37 HANDHOLE ADJUSTED EACH

The work under this Item shall conform to the relevant provisions of Section 201 and 801 of the Standard Specifications and the following:

Service handholes and/or pullboxes shall be adjusted to proposed line and grade. Masonry shall be removed and new masonry constructed to conform to the proposed design.

Frames and covers determined to be unsatisfactory for reuse shall become the property of the Contractor and shall be removed and discarded. Replacement of frame and cover shall be considered incidental to this item; frame and cover shall be replaced in kind, including material and load rating.

BASIS OF PAYMENT

Compensation for this work shall be at the contract unit price bid for each item and shall include furnishing all labor, tools, materials, and all incidentals necessary to adjust, modify and install as specified, complete, in place, at the required grade directed by the Engineer.

Handhole for property bounds in sidewalk shall be adjusted under this item.

ITEM 811.91 HANDHOLE TYPE A (STREET LIGHTING) EACH
ITEM 811.92 HANDHOLE TYPE B (STREET LIGHTING) EACH

The work to be done under these Items shall consist of furnishing and installing electrical handholes for the Street Lighting System at the location shown on the plans, including grounding rod and ground conductor, as specified herein.

All work performed shall be in accordance with Section 820, Highway Lighting, of the Standard Specifications, and as specified herein and in the Appendix.

Type A Handholes (24” x 36” x 24”), tier 22, shall be of composite material as manufactured by “Quazite”, Cat No. PG2436BA24-HA w/ Heavy Duty Cover; Synertech or approved equal.

Type B Handholes (11” x 18” x 12”), tier 22, shall be of composite material as manufactured by “Quazite”, Cat No. PG1118BA12-HA w/ Heavy Duty Cover; Synertech or approved equal.

Covers shall be heavy duty and have the word “LIGHTING” cast into the cover. The color of the cover shall match the color of surface surrounding the cover, as approved by the Engineer.

Payment under these Items shall be at the Contract Unit Prices bid per Each, which prices shall be full compensation for furnishing and installing handhole with cover, and performing all necessary or incidental work including saw-cutting, excavation, bedding, gravel borrow, backfilling and compaction ground rods, complete in place as detailed on the plans.

ITEM 814.1 POWER GROUND BOX EACH

The work to be done under this Item shall consist of furnishing and installing in ground box for the Holiday Lighting System at the location shown on the plans, including grounding as specified herein. This is noted as Exterior Outlet Type 1 on the Lighting Plans.

All work performed shall be in accordance with Section 820, Highway Lighting, of the Standard Specifications, and as specified herein and in the Appendix.

Power Ground Box shall be Wiremold Outdoor Ground Box as manufactured by Legrand. Local representative for Legrand is Anthony Pires, anthonypires@legrand.us or approved equal. Box shall be UL50E Type 6 and IP68 rating for outdoor locations.

Box shall be single service, 2 gang nonmetallic and color black. Bottom of box shall have two (2) ¾” – 1-1/4” trade size conduit feed locations

Exterior box assembly (5-20R) shall be prewired with two (2) 20-amp weather resistant duplex receptacles. Both receptacles shall be wired on a single circuit. Assembly shall be NEMA 6P rated.

Power Ground Box shall be installed under the tree grates as per manufacturer’s recommendations and shown on the drawings. Coordinate installation of wiring, power ground box, tree planting and tree grate.

Payment under this Item shall be at the Contract Unit Prices bid per Each, which prices shall be full compensation for furnishing and installing power ground box, and performing all necessary or incidental work including excavation, bedding, gravel borrow, backfilling and compaction, complete in place as detailed on the plans.

ITEM 814.2 GFCI BOX ON RIGID CONDUIT EACH

The work to be done under this Item shall consist of furnishing and installing 20-amp weather resistant duplex receptacles on rigid conduit at the location shown on the plans, as specified herein. These are noted as Exterior Outlet Type 2 and 3 on the Lighting Plans.

All work performed shall be in accordance with Section 820, Highway Lighting, of the Standard Specifications, and as specified herein and in the Appendix.

Weather resistant GFCI receptacle shall meet NEMA XXX, 20-amp, 125V and be enclosed in a weatherproof (weathertight) box with a hinge for access.

Material for rigid conduit shall meet national and local codes.

Install receptacles so that the bottom of the receptacle is a minimum of 6 inches above finish grade in the planters with wood seat and 12 inches above finished grade in all other locations.

Payment under this Item shall be at the Contract Unit Prices bid per Each, which prices shall be full compensation for furnishing and installing GFCI receptacle and box, and performing all necessary or incidental work including excavation, bedding, gravel borrow, backfilling and compaction, complete in place as detailed on the plans.

ITEM 816.01 TRAFFIC SIGNAL RECONSTRUCTION LOCATION NO. 1 LUMP SUM

Work under the above items shall be performed according to the provisions of Section 800 supplemented by the following:

The work consists of furnishing and installing traffic control signal equipment complete and ready for operation, as shown on the plans for the intersection of Massachusetts Avenue (Routes 4 and 225) and Waltham Street.

The work shall include modifying, furnishing, installing and removing and resetting of traffic control signal equipment including all, or part, of the following items: traffic signal controller; cabinet and concrete foundation; signal posts and concrete foundations; mast arms; emergency vehicle preemption system; vehicle signal heads; red, amber, and green LED signals, louvered backplates; pedestrian signal heads; accessible pedestrian pushbutton assemblies; software; all cable and wiring; ground rods, equipment grounding and bonding; video detection system; Gridsmart video processor; saw cuts, electrical connections, service connections; removing and disposingexisting signal equipment not required for the final signal operation, and all other equipment, materials and incidental costs necessary to provide a complete, fully operational traffic control signal system as specific herein and as shown on the plans. Contractor shall make necessary connections and adjustments to restore existing operation in the new cabinet.

A list of required major traffic signal system items is included on the plans. All equipment installed shall be listed on MassDOT’s “Qualified Traffic Control Equipment List”. The Contractor shall deliver to the Engineer a certificate of compliance with the manufacturer for all materials purchased from the manufacturer. All proposed signal controller cabinet equipment shall be copatible with the existing signal equipment.

The Contractor shall request written approval from the Owner or its Designated Agent before the placement of any concrete for foundations of signal posts and cabinets.

The top of the concrete base for the control cabinet shall be 18 inches above grade. The top of all other foundations not in sidewalk or paved areas shall be a minimum of 2 inches above grade. The top of mast arm foundations in sidewalk areas shall be located flush with finish grade.

Service Connection

A service connection in conformance Section 813 of the Standard Specifications shall be made at the traffic signal controller cabinet. The intention is to reuse and reroute the existing service connection from the existing to the proposed signal cabinet. The Contractor may, as an alternate means, provide a new service connection. The Contractor may provide a new service connection from the proposed signal cabinet to the underground manhole as shown on the plans, or similar, at no additional cost.

The Contractor shall install 3-inch conduit and wire from the existing signal cabinet or proposed service source to the controller cabinet. The serving utility shall connect the source of supply to the wires installed by the Contractor. No work shall be done in manholes or on power poles without a representative of the serving utility company being present. The Contractor will be responsible for coordinating the serving utility company work.

The Contractor shall notify the serving utility that construction has begun immediately after receiving notice to proceed with construction. The Contractor shall schedule with the serving utility the installation of service connection and main power shut-off, if required. The Contractor shall not permanently patch or install the final roadway pavement until the service connection, including all work performed by the serving utility has been completed.

It shall also be the Contractor's responsibility to pay all charges to the serving utility for performing this work. No direct reimbursement will be made under this payment to the Contractor for payments made to the serving utility, it being understood that full compensation for any payment made by the Contractor to the utility company will be included in the contract unit prices bid. The Contractor shall also be responsible for securing and paying for all electrical permits as required from the Town of Lexington. The cost of these electrical permits shall be incidental to the Item.

Flashing Operation
Changes from automatic flashing to stop-and-go operation and from stop-and-go to automatic flashing operation shall occur as set forth in Sections 4D.28 through 4D.31 of the MUTCD.

Traffic Signal Controller and Cabinet
The controller, malfunction management unit, bus interface units, video detection units, and all other ancillary traffic signal control components included in the traffic control cabinet shall comply with the latest revision of the National Electrical Manufacturers Association (NEMA) Standard No. TS 2. The cabinet shall be fabricated of sheet aluminum to size 6 dimensions as specified in Table 7.3-1 of the NEMA TS 2 Standards.

Traffic Signal Controller Assemblies
The controller and cabinet assembly shall be supplied in an 8-phase, TS 2 Type 1 configuration as required in the list of major traffic signal items included in the plans

Controller cabinet foundations shall not obstruct a sidewalk or crosswalk so that passage by physically-challenged persons is impaired. Anchor bolts shall be internal to the cabinet.

TS 2 Type 1 Controllers and Cabinet Assemblies: Controllers shall conform to Section 3, Controller Units of NEMA No. TS 2, Traffic Controller Assemblies. Controllers shall utilize an input/output interface conforming to Section 3.3.1 of the NEMA TS 2 Standard for all input/output functions with the backpanel terminals and facilities, the malfunction management unit, video detection devices, and auxiliary devices.

The TS 2 Type 1 cabinet shall meet the requirements of Configuration 3 as defined in Table 5.3.1-1, "Type 2 Configurations" of the NEMA TS 2 Standard. The cabinet shall be fabricated of sheet aluminum to Size 6 dimensions as specified in Table 7.3-1 of the NEMA TS 2 Standards. The cabinet shall have a brushed aluminum flat black finish.

The cabinet shall also be wired with a normally closed switch connected to a user defined input to the controller for remote monitoring of the control cabinets' door open status.

The following requirements are applicable to the signalized location and are designed for effective use of a laptop computer in conjunction with traffic signal controllers. These requirements are also designed to permit all engineers, electricians and technicians (including those who are disabled but ambulatory) to work in the cabinet in a safe, effective and comfortable manner. To this extent, the following meets applicable ADA requirements.

1. Adjust the control cabinet height by use of a cabinet extender, adjust the placement of cabinet shelves, adjust the height of the cabinet foundation or provide any combination of these three items so that the top of the LCD or other visual display window of both the local controller and the master controller is no more than 48" above finished grade in front of the cabinet. The top of the cabinet door opening shall be at least 5'8" above finished grade. Any technical provision, plan detail, standard specification or standard drawing to the contrary shall not apply to the extent that it may conflict with this viewing height requirement.

2. Furnish and install one slide-out/slide-in shelf or swing-out/swing-in shelf appropriate for the size and load of a laptop computer. This moveable shelf shall support the bottom of the laptop computer at a height between 3'-4" and 3'-8" above finished grade in front of the cabinet.

3. Furnish and install a paved pad in front of the control cabinet. This pad shall be of cement concrete, built in accordance with the sidewalk specification applicable to this project, approximately level, approximately 1" above the surrounding unpaved surface, or at even grade with the adjacent surface if paved. This pad shall abut the front of the cabinet, project at least 1' to each side of the cabinet and at least 3' in front. No pad is required if the front of the cabinet immediately abuts an existing or proposed paved sidewalk or other paved surface.

4. Both the firmware and software version in each timer unit shall be the same throughout the project, and shall be the latest version available on the market. In addition, the contractor shall promptly furnish to the owner and install all upgraded versions of both firmware and software through the last day of the inspection period, guarantee period or warranty period, whichever date is later.

5. The contractor shall furnish one cable with each new timer unit to connect a controller timing mechanism to a laptop computer. This cable shall have a termination at one end to match the controller. It shall have a termination on the other end to match the type of serial port found on laptop computers, usually DB9. This cable shall be wired to provide serial RS232C communication between the controller and the computer.

6. Payment for the work described above shall be deemed to be incidental to and included in the prices bid for various items of traffic signal work, and no additional payment shall be made for the work described above.

Bus Interface Units

The Bus Interface Unit (BIU) shall comply with Section 8 of the NEMA TS 2 Standard. The BIU shall be fully interchangeable with any other manufacturer's unit and interchangeable in a NEMA TS 2 Type 1 cabinet assembly.

The BIU shall perform the interface function between Port 1 at the controller unit, the malfunction management unit, loop detector rack assembly, and the backpanel terminal and facilities.

As a minimum, two LED indicators shall be provided on the BIU front panel. One indicator shall serve a dual use; as a power on indication and as a diagnostic indicator for proper operation of the device. The second indicator shall serve as a transmit indicator illuminating each time data is transmitted.

NOTE WELL: The contractor shall supply one additional spare BIU in each controller cabinet.

TS2 Cabinet Power Supply

A separate power supply shall be supplied and installed in each of the TS 2 cabinets. The unit shall be AC line powered and provide regulated DC power, unregulated AC power, a line frequency reference for the bus interface units, load switches, and other auxiliary cabinet equipment, as required. As a minimum, the power supply shall meet all requirements of Section 5.3.5 of the NEMA TS 2 Standard.

The power supply shall be either shelf mounted or wall mounted utilizing key hole slots for ease of replacement or installed as part of the rack assembly.

The unit shall contain four LED indicators on the front panel to indicate the four outputs; + 12 VDC +/- 1 VDC @ 2.0 amps, + 24 VDC +/- 2 VDC @ 2.0 amps, 12 VAC @ 250 milliamps, and 60 Hz line frequency reference. A test point terminal shall also be located on the units front panel for + 24VDC and logic ground testing.

Malfunction Management Unit

The malfunction management unit (MMU) shall comply with Section 4 of the NEMA TS 2 standard. The MMU shall be capable of operating as either a Type 16 with 16 channels (8 vehicle, 4 pedestrian, 4 overlap) or a Type 12 with 12 channels (8 vehicle, 4 overlap). The MMU's supplied shall be configured to operate as Type 16 units. The MMU shall be capable of supporting flashing yellow arrow operation.

The MMU's in either the Type 16 or Type 12 configuration shall be capable of operating in a NEMA TS 2 Type 1 cabinet or a NEMA TS 1 cabinet without loss of functionality.

Video Detection System

The Contractor shall remove and reset the existing Video Detection System ,except for the video detection camera. The existing video detection processor shall be upgraded with the latest Gridsmart GS2 Processor and to ensure compatibility with the Town's existing video detection system.

Load Switches

Load switches shall comply with Subsection 6.2 of the NEMA TS 2 Standard. All load switches shall utilize optically isolated encapsulated modular solid-state relays. Discrete components on circuit boards are not acceptable.

Load switch indicator lights shall be LED-type and wired on the input side of the device.

Note: The controller cabinet assembly shall be initially supplied with a full complement of load switches to accommodate each available position of the backpanel.

Flasher

Flashers shall comply with Subsection 6.3 of the NEMA TS 2 Standard and be equipped with two output indicator lights which will show flashing power out to the cabinet assembly.

Flash Transfer Relays

Flash transfer relays shall comply with Subsection 6.4 of the NEMA TS 2 Standard.

The field electrical loading for flash operation shall be wired through the transfer relays such that the load on the 2-circuit flasher is as balanced as possible within the limitations of the signal phasing.

Note: The controller cabinet assembly shall be initially supplied with a full complement of flash transfer relays to accommodate each available position of the backpanel.

Testing of Grounding System

The Contractor shall perform testing of the equipment grounding system in the presence of the Engineer in accordance with the Standard Specifications. A ground rod shall be installed in the controller cabinet.

Software

All computer system, controller, conflict monitor, and amplifier software shall be supplied with the latest available revision. Any software upgrades released by the manufacturer shall be supplied at no charge to the Town for a period of five years after acceptance of the work.

Data Base Programming

Each programmable local hardware component (controller, malfunction management unit, and detector amplifier) shall be initially programmed by the Contractor based on information contained on the plans. Three (3) sets of hard copy programming per device shall be supplied and stored in each controller cabinet.

Surge Suppression for Traffic Signal Equipment

Wherever electronic traffic signal equipment is located (cabinets, cameras, etc.), each input & output should be surge protected except traffic signal outputs. Signal outputs from load switches do not need surge suppression since the load switches act as surge suppressors.

The surge protector must be electrically connected to the nearest grounded metal structure or nearest ground rod.

Surge protection for power service shall conform to the current NEMA TS-2 standard except surge capacity shall be 80 kA. The product complies when a lab report from an independent test laboratory stating the product passes the current NEMA TS-2(5.4.2.4) specification (with the additional surge capacity of 80 kA) is submitted with the shop drawings.

Surge protection for all video, loop, pedestrian button, and pre-emption connections should have peak surge current protection of at least 10K amperes with a response time of less than 5 nanoseconds. The product complies when a lab report from an independent test laboratory stating the product passes this specification is submitted with the shop drawings.

Units should be unconditionally warranteed for at least 10 years.

Equipment Finish and Color

All existing and proposed traffic signal equipment, as shown on the plans, including, but not limited to, signal posts, bases, signal heads, visors (outside), mast arms, doors, pushbutton saddles, controller cabinet, service meter socket boxes, hardware, strapping, and rigid mounting brackets for signals and signs, shall be the color **Flat Black** which shall match Color Number 37038 of the Federal Standard 595A "Colors Used in Government Procurement" or approved equal. **This includes the metal strapping used to secure equipment to the mast arm and shaft**. The inside of visors shall also be **Flat Black** in accordance with Federal Color Number 37038 or approved equal. The interior of controller cabinets shall be the color white. The Contractor shall submit to the Engineer, Design Engineer (BETA Group), and Town of Lexington for approval paint chips and sample finishes on aluminum and steel of the intended color prior to any work being done under this heading. All existing signal poles including Mast Arms shall be repainted Flat Black to match the proposed equipment.

The existing equipment shall be power washed and sanded to remove rust and smooth out any other sharp protrusions prior to painting. The existing equipment painting shall be performed on a dry day with a temperature between 60 to 80 degrees on site. A minimum application of primer and one coat of paint shall be required and to the satisfaction of the Resident Engineer/Town. The equipment shall be protected during the process. Any damage to the equipment will be responsibility of the Contractor,

Signal heads, doors, visors, mounting brackets, and hardware supplied direct from the manufacturer in the color stipulated above may be acceptable provided it meets or exceeds the finish process for the material indicated below.

1. **Steel Equipment**

Galvanizing
All bolts, screws, nuts, rods and washers shall be galvanized in accordance with AASHTO M232 and the Standard Specifications. The hardened machine screws may be electroplate galvanized. Stainless steel studs, bolts, screws, nuts, straps and washers shall not be galvanized. Galvanized hardware need not be painted; however, the ends of bolts, nuts, and washers shall be painted in the field according to section "Touch-up and Repairs." Immediately prior to galvanizing, the steel shall be immersed in a bath of zinc ammonium chloride. The dry kettle galvanizing process shall be used.

All steel components, other than above, shall be galvanized after fabrication in accordance with AASHTO M111. The galvanizing bath shall contain nickel (0.05% to 0.09% by weight) in accordance with subsection 960.61 of the Standard Specifications.

Galvanized members requiring shop assembly shall be welded and drilled prior to galvanizing.

Coating Over Galvanized Steel
Prior to painting, the applicator shall ensure that all components are smooth and without sharp protrusions that would present an injury hazard to pedestrians. Also, the fabricator shall ensure that all welds shall be thoroughly cleaned in accordance with good practice and according to AWD D1.5 and ASTM A123-89a and shall have a suitable surface to accept the galvanizing.

In preparation for the two coat painting system, the surface shall be blast cleaned in accordance with the requirements of SSPC-SP-7 "Brush-Off Blast Cleaning" or other method producing equivalent results and uniform profile, to achieve a 1.0 to 1.5 mils anchor profile as indicated be a Keane Tator Profile Comparator or similar device. The creation of the anchor profile shall be performed prior to the formation of "white rust" on the galvanized surface. Following blast cleaning, the zinc coating thickness shall be measured to verify that the coating thickness is in accordance with AASHTO M111.

A two coat painting system shall be applied by the Galvanizer in his own facility within twelve hours of galvanizing the steel components. If the two coat painting system cannot be applied by the Galvanizer within twelve hours of galvanizing, the Galvanizer shall bake the steel components at 375 degrees for two hours prior to SSPC-SP-7 "Brush-Off Blast Cleaning".

The prime coat material shall be a polyamide epoxy applied to minimum dry film thickness of 4.0 to 6.0 mils and force cured as given below for the finish coat.

The finish coat material shall be a two-component, catalyzed aliphatic urethane applied by airless spray to a minimum dry film thickness of 4.0 mils.

The color shall be flat black. The fabricator shall submit to the Engineer for approval, paint chips of the intended color prior to any work being done under this heading.

All finish coat material shall be applied under conditions within the following tolerances:

A.	Air Temperature	10°C min.,	32°C max.
B.	Surface Temperature	10°C min.,	38°C max.

C. Surface temperature must be at least 3°F above the dew point.

The finish coat shall be cured in a booth capable of maintaining 65°C for 2-4 hours.

A prime coat and a two-component finish coat, as specified herein and as per manufacturers recommendations, shall also be applied to the existing traffic signal equipment to be retained and reused.

For the repainting of the existing signal equipment/poles, the existing paint shall be stripped and blast cleaned prior to being painted.

Touch-up and Repairs
Should any damage occur to the galvanized coating during shipping or handling at the job site, the Contractor shall repair and touch-up any damaged areas to the satisfaction of the Engineer and the following:

Touch-up of galvanizing before the finish coat is applied shall be accomplished by applying a galvanizing repair paint in accordance with Section M7.04.11. The dry film thickness of the applied repair paint shall not be less than 4.0 mils. Applications shall be in accordance with the manufacturer's instructions.

Field touch-up procedures shall conform to the recommendations of the galvanizer. Touch-up of the finish coat shall be by applying a coating of a two-part urethane, as supplied by the Galvanizer, to achieve a dry film thickness of at least 4.0 mils. Prior to the application of the paint, remove all damaged coatings down to a solidly adhered coating and apply galvanizing repair paint as primer. Allow the primer to dry for at least 4 hours prior to top coating.

The Contractor shall also use the touch-up paint material and procedures to paint the galvanized hardware used in field erection that has not been finish coated previously and for existing signal equipment to be retained and reused.

2. **Aluminum Equipment**

All aluminum equipment called for shall have a powder coat finish flat black in color. The coating shall be a polyester-TGIC (triglycidyl isocyanurat) resin system conforming to the following:

Quality	Test	Limits
Abrasion	Taber abraser CS-10, 1000 gram load, 1000 cycles, ASTM D4060	100 mg. maximum weight loss
Adhesion	ASTM D 3359	
	Initial	5A
	1000 hours	5A
Gloss	ASTM D 523	
	15EC - 600 hours	82% retention
	15EC - 1000 hours	90% retention (washed)
Hardness	ASTM D 3363	2H - No Gouge

Quality	Test	Limits
Impact	ASTM D 2794 Direct	Pass 6.59 Nm
Salt Spray Resistance	ASTM B 177 ASTM D 1654 1000 hours unscribed 400 hours scribed	 Table 2-10 Table 1-10
Weather Resistance	ASTM G 23, 1000 hours, 18 min. waterspray, 102 min. light	No film failure
Color	Flat Black	
Identify	Infrared fingerprint	Match
Flexibility	180E bend; 13mm dia., mandrel within 10 seconds	No breaks, flaking or cracks. Tested with a Q-panel with 2 mils or less of coating
Humidity	ASTM D 2247, 1000 hours	No blister or film failure
Thickness		4 mils± 1 mils
Mar Resistance		Good

A Certificate of Compliance of the powder coating system is required for the Engineer's approval.

Mast Arm Structures and Foundations
Mast arm structures and foundations shall be retained and mast arm shall be repainted in flat black All signal heads and signs on the mast arms shall be fixed mounted and signal heads shall be painted black.

Labels
All time settings, switches, harnesses, relays, terminals, and fuses shall be clearly and permanently labeled.

Pedestrian Signal Heads
All pedestrian signal heads shall be mounted so that there is a minimum of 24 inches between any part of the housing or visor and the outer face of the curb. All pedestrian signal heads shall be aluminum.

Pedestrian signals shall be an approved single section 16 inch Light Emitting Diode (LED) type pedestrian signal head capable of displaying international symbols ("Hand/Person Walking" indications) as per the MUTCD with a countdown display.

Countdown Pedestrian Display
The internal countdown module shall be comprised of two 7-segment digits, 8 inches high and made of LED's. The countdown module shall display the number of seconds remaining throughout the “DONT WALK” pedestrian interval, and blank out when not activated. All LED indications on the pedestrian signal shall have an automatic dimming circuit for night illumination to reduce long-term degradation to the LED's.

Acessible Pedestrian Pushbutton
Pedestrian pushbutton controls shall be raised from or flush with their housings and shall be a minimum of 2 inches in the smallest direction. The force required to activate the controls shall be no greater than 5 pounds.

Pedestrian pushbuttons shall be an accessible pedestrian type in accordance with Section 4E.09 of the 2009 MUTCD and shall include a red LED confirmation light, locator tone, vibrotactile arrow pushbutton, audible message capability and an instructional panel. Pushbuttons shall meet all ADA and MassDOT standards for Accessible Pedestrian Signals (APS). Pushbuttons shall be located according to the plans and in conformance with Fig 4E-4 of the 2009 MUTCD, with arrow pointed parallel to the crosswalk being controlled. If two crosswalks, oriented in different directions, end at or near the same location, the positioning of pedestrian pushbuttons and/or legends on the pedestrian pushbutton signs shall clearly indicate which crosswalk signal is actuated by each pedestrian pushbutton. Pushbuttons shall be separated by a minimum 10 foot distance per MUTCD Fig 4E-3, unless otherwise shown on the plans. If push button extension is needed to meet ADA requirements, it shall be provided at no additional.

Mounting height shall be 42 inches above the finish grade, in accordance with MUTCD and AAB standards.

Backplates
Backplates shall be aluminum with a 5 inch border width. Only backplates that are listed in the latest MassDOT "Qualified Traffic Control Equipment List" will be used on this project.

Posts and Bases
All traffic signal posts shall be galvanized steel and painted flat black. Bases shall be of the pedestal type. Bases shall be provided with a door opening and a cast aluminum door complete with a cap screw fastening device and a tapped hole for a grounding.

Vehicle Signal Heads
All proposed vehicle signal heads shall be aluminum with a flat black body and door. When, in judgment of the Engineer, the visibility of existing or proposed signal faces will be obstructed by trees and other vegetation, the contractor shall clear the obstructions for proper sight distance. Any clearing necessary shall be done as directed by the Engineer.

LED Vehicle and Pedestrian Signal Modules
The LED module shall be an approved item from MassDOT’s Qualified Traffic Control Equipment List.

If the LED module conforms to the latest ITE performance specifications and is Energy Star compliant, it may be submitted for approval to be placed on the Qualified Traffic Control Equipment List. See the above PDF document for instructions.

To prevent the LED module warranty from being voided, the connecting leads on the module shall not be cut. The original LED module leads shall be connected to the signal head terminal block as continuous wire without splices.

The LED signal module will be replaced or repaired by the manufacturer if it exhibits one of the following:

> A failure due to workmanship or material defects within the first 60 months of field operation.
>
> A greater than 40 percent light output degradation or a fall below the minimum intensity levels (as defined by the latest ITE performance specifications) within the first 36 months of field operation.

Wiring and Service Connections
Traffic signal cable shall be of Type 2, #14 AWG stranded, 10-conductor minimum meeting the requirements of IMSA Specification 20-1, except for mast arm and /or span wire traffic signal cable, which shall be Type 2, #14 AWG stranded, 5-conductor minimum meeting the requirements of IMSA Specification 19-1. All systems shall have a minimum of one (1) 10-conductor cable for each vehicle phase, overlap phase, and pedestrian phase for controller outputs to field wiring required by the timing and

sequence plan. A minimum of a five (5) spare conductors shall be provided in the base of each signal post and mast arm. Openings, where cables enter the base of a cabinet, shall be sealed with an approved elastic sealing compound. The open ends of conduits entering or leaving mast arms, posts, and pull boxes shall also be sealed with the approved elastic sealing compound.

The work for service connections shall consist of furnishing and installing all materials and equipment to deliver power to the traffic signals and related electrical systems.

Optical Emergency Preemption System

The work consists of furnishing and installing optical traffic signal preemption systems ready for operation, as described herein and shown on the plans. Included in the work is the furnishing and installing of traffic signal preemption unit and related equipment, optical detection equipment and all necessary connections to the traffic signal controller. The emergency preemption system equipment shall be included in the latest version of the MassDOT Qualified Traffic Control Equipment List, and shall be compatible with the Town of Lexington's existing emergency preemption system.

The emergency preemption system shall consist of a data-encoded phase selector to be installed within the existing control cabinet. This unit will serve to validate, identify, classify, and record the signal from the optical detectors located on support structures at the intersection. Upon receiving a valid signal from the detector, the phase selector shall generate a preempt call to the controller initiating a preemption operation as shown on the plans.

The phase selector shall be a rack-mounted plug-in four-channel, dual-priority device. The phase selector shall plug into a shelf-mounted single card slot chassis. Programming the phase selector shall be via a PC-based computer utilizing unit specific software. One copy of software on a disk shall be supplied and licensed to the Town as part of this contract. A hard copy of final programming data shall be left in the control cabinet. The Contractor shall supply a complete set of interface cables for phase selector to laptop connection.

Emergency vehicles equipped with optical energy emitters transmit optical energy impulses to optical detectors mounted at the intersection. When optical energy impulses are received at the intersection, control of the signals shall transfer from the local controller to show a selected display shown on the plans to assist the vehicle through the intersection without conflict. After the vehicle has passed through the intersection, control of the signals shall then return to the local controller which shall restore the appropriate timings that were in effect prior to preemption.

Preemption Indicator Light

A preemption indicator light shall be provided and mounted as shown on the plans. It shall be located in a position where it may be visible from all preemption approaches to each intersection. The light shall be weather tight and consist of a clear (white) strobe which shall be illuminated whenever the controller is in the emergency preemption phase. A separate cable is required for the indicator light; the spare signal cable shall not be used. The indicator light shall meet ITE, NEMA, IMSA, and MassDOT standards.

Fine Tuning, Testing and Adjustment Period

After the Contractor has finished installing the controller and all other associated signal equipment to operate as specified in the contract documents, the fine tuning, adjusting and testing period shall begin. During this period, the Contractor, under the direction of the Engineer, will make necessary adjustments and tests to insure safe and efficient operation of the equipment. No request for final acceptance will be considered until successful completion of the testing period.

Guarantee After Final Acceptance
The Contractor shall diagnose (trouble-shoot) the system and, at his own expenses replace any part of the traffic signal control equipment found to be defective in workmanship, material or manner of functioning within six months from date of final acceptance of all the installations under this Contract. This requirement does not affect the one-year warranty period on equipment specified in Subsection 815.20 of the Standard Specifications.

Upon the date of acceptance of the project by the Town of Lexington, the Contractor shall turn over all guarantees and warranties to the Town of Lexington, where applicable.

Removing and Disposing of Existing Signal Equipment
All existing vehicular and pedestrian signal heads, associated posts, pushbutton assemblies, and any other materials shall be removed and disposed. Mast arms will be retained in place.

All traffic signal equipment to be removed and shall become the property of the Contractor and disposed of subject to the regulations and requirements of local authorities governing the disposal of such materials, at no additional compensation.

Record Traffic Signal Layout Plans
It is the responsibility of the Contractor to provide electronic Record traffic signal layout plans indicating all changes made during construction. The plans shall indicate the location of traffic signal equipment retained, removed and reset, and installed, including detectors, signal posts, mast arms, pedestrian and vehicular signal heads, controller cabinets, conduit, pull boxes and service connections. The plans shall also indicate the final field timing and sequence, major items list, power-pole number, and meter number.

Miscellaneous Requirements
The actuated controller shall have capability to preempt to a preselected phase by external command. Because this is often overlooked, the Contractor's attention is drawn to the requirements of Section 813.60C, Splicing, relative to four optional methods of splicing in signal bases, Section 813.40C, Ground Electrodes, relative to Requirement 1 - Connection to a Water Piping System, and Section 813.61, Equipment Grounding.

All anchor bolts and bolts for holding hand hole and access covers shall be greased at the time of installation.

All proposed conduit shall be 3 inch Type NM, plastic conduit unless otherwise specified. 3 inch conduit shall be paid for under Item 804.3 and shall not be included in the lump sum bid price for Item 816.01.

The Contractor shall make all necessary arrangements with the electric company for the service connections or for any main power cut off when necessary, and bear all charges incurred thereby.

The Contractor shall notify the Town of Lexington of the starting date of the fine tuning period and shall have Town of Lexington present for an inspection of the traffic signal.

BASIS OF PAYMENT
The lump sum price bid for Item 816.01 shall constitute full compensation for all labor, materials, and equipment necessary or incidental to the installation of a complete intersection traffic control signal system functioning as specified and as shown, including excavation and backfill, foundation, pullboxes and handholes, painting, protection of equipment, adjustment of existing traffic signals during construction, removal and disposing of existing equipment, service connections and all charges therefore, except for the 3 inch electrical conduit, Type NM Plastic (UL), which will be paid for under Item 804.3.

All traffic signal pull boxes (Item 811.23) and handholes (811.31) shall be paid under their respective items.

ITEM 820.15 STREET LIGHTING LOAD CENTER EACH

The work to be done under this Item shall include, but not be limited to, the installation of all electrical wiring and cabling for the entire load center system, meter sockets, electrical metering, control cabinet, distribution panels, circuit breakers, GFI receptacles (where specified), foundations, appropriate grounding all in accordance with the applicable provisions of Sections 813 and 820 of the Standard Specifications. This Item shall also include conduit, cabling and related fees to provide an underground service connection to Eversource facility.

The Contractor shall obtain all necessary permits and licenses, file necessary plans, and pay all fees for permits and inspections. Permit fees are the responsibility of the Contractor as part of his bid.

SUBMITTALS:
List of materials and equipment requiring shop drawings shall include:

1. Rigid Conduit
2. Panelboards
3. Service Cabinets and Equipment
4. Meter Sockets
5. Disconnect Switch
6. Circuit Breakers
7. Wiring Devices and Receptacles
8. Time Clock

MATERIALS:
Materials and products furnished shall be designed for the intended use, shall meet all requirements of the latest edition of the National Electric Code (NEC), and all local codes.

Materials shall be manufactured in accordance with the standards indicated in this Section, and typical industry standards and codes for the products specified. Materials and equipment shall be Underwriter's Laboratory (UL) listed.

The materials used shall be new, unused, and of the best quality for the intended use. All equipment shall have the manufacturer's name, address, model or type designation, serial number and all applicable ratings clearly marked thereon in a location which can be readily observed after installation. The required information should be marked on durable nameplates that are permanently fastened to the equipment.

Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored outside exposed to the elements. If any equipment or apparatus is damaged, such damage shall be repaired at no additional cost, or replaced at no additional cost as directed by the Engineer.

Wire & Cable:
Unless otherwise noted, conductors for power, lighting, and grounding *above grade* shall be No. 12 through No. 8 AWG, NEC type THWN/THHN, meeting the requirements of UL 83. Conductors for power and lighting shall be no smaller than No. 12 AWG.

All conductors shall be annealed copper, 98% conductivity, Class B stranded, except conductors used for power and lighting circuits No. 10 AWG and smaller which may be solid. All conductors should be rated for 600 volts or less, with a thermal rating of 90° C.

The outside covering of all wiring for power, lighting, grounding, and control uses shall be color coded to identify polarity as follows:

Phase	Color
A or 1	Black
B or 2	Red
C or 3	Blue
Neutral	White
Equipment Ground	Green

Raceways (Conduit):
Rigid Metallic Conduit: UL6 and ANSI C80.1.
Non-Metallic Conduit Schedule 80.

Flexible Metallic Conduit: UL1. Liquid tight flexible metal conduit shall be used in wet locations.

Minimum size of conduit shall be 3/4”. Unless indicated on Drawings, conduit sizes can be sized in accordance with National Electric Code (NEC). Conduit bends shall not have kinks or flats, and shall not be less than standard radii.

Non-Metallic, Schedule 80 (NM) conduit shall be used for all power wiring, except where noted.

Conduits shall be made electrically continuous at coupling and connections to boxes and cabinets by means of joining fasteners or copper bond wires. Conduit shall be connected to grounded structural steel or the ground network. After assembly all conduit locknuts, all EMT coupling fittings, and all bond wire screws shall be set up tight before installation of wiring. Insulated metallic bushings shall be used on all conduits entering panel cabinets, handholes, and wiring gutters, except on branch lighting circuits.

Expansion fittings shall be provided on all conduits as required by the latest National Electrical Code, and as required by local and state codes. This includes, but is not limited to, vertical conduit risers coming from below-grade.

Boxes:
Outlet and Switch Boxes: NEMA OS 1.

Pull Boxes, Junction Boxes, and Equipment Enclosures: NEMA ICS 6.

Handholes, junction boxes, and equipment enclosures shall be of NEMA Type 1 construction for indoor use, and NEMA Type 3R construction for outdoor or wet location use, unless otherwise noted.

Box sizes shall not be less than that required by the Massachusetts Electrical Code.

Wiring Devices
Wiring Devices: NEMA WD 1.mm. They shall be specification grade, 20 ampere, ivory with Type 302 stainless steel plates. Ground fault current interrupter (GFCI) devices shall be provided where specified and/or required by applicable codes.

Panelboards
They (NEMA PB1, and UL 67) shall be door-in-door construction with copper bus. Circuit breakers shall be molded case, thermal magnetic, bolt-on type rated as noted, and rated to match panelboard voltage and interrupting rating (22kA minimum). Circuit breakers should be capable of accepting up to #4 Awg wiring.

Panelboard to be 200A, 1-phase, 120/240V with circuit breaker minimum quantities as shown on Contract Drawings. Provide 200A/2Pole main circuit breaker in panel, and sufficient breakers for lighting circuits and receptacle in cabinet.

Meter Sockets:
Meter Sockets: UL 414, UL 486B, and ANSI C12.7.

Outdoor meter sockets are to be NEMA 3R, and have vandal-proof covers to protect utility kWh meters (if specified). Unless otherwise noted, meter sockets shall be ringless, with lever bypass, tin plated connections, and have provision for a fifth terminal on single-phase applications.

Meter Socket shall be either heavy duty or medium duty, 200 ampere, ringless, 5 terminal, with approximate dimensions of 19”H x 13”W x 5”D. (Milbank U9319-XL, Eaton, Square-D or brooks Manufacturing or approved equal). Socket to meet local utility requirements.

Load Center Cabinet:
Provide outdoor NEMA 3R Highway Lighting Control Center Cabinet. Contractor to size cabinet to coordinate with sizes of panelboard and equipment to be installed within cabinets. Dimensions shown are typical and are for reference only. Cabinet to include all equipment shown or implied and all equipment shall be installed inside of cabinet without physical conflicts and per NEC. Cabinet to be sized for all necessary conduits, whether active, spare or future as listed on panelboard schedules.

Cabinets to be manufactured from 14 gauge minimum stainless steel with 12 gauge steel panel, mounted inside. Cabinets to have integral keyed locking mechanism, keyed alike, with provision for pad-lock. Cabinets shall be ventilated type and with a factory applied **black powder-coat including the meter socket**. Field painting is not acceptable. Cabinets to have door hold-open latches.

Provide outdoor-rated 200A meter socket mounted on the side of the cabinet to meet local utility requirements. Meter socket to be 200A, 120/240V, 10kA minimum AIC, NEMA 3R.

Provide the following internal components:

- Duplex GFCI receptacle, white, 20A, with stainless steel cover
- SPST switch, rated 120V, 20A for internal light switch
- 120V, 75W incandescent light fixture in ceramic socket inside of cabinet
- On/Off/Auto selector switch, rated 120V, 10A in NEMA 1 enclosure (2 total)
- Time Clock, 120V, SPST, 20A in NEMA 1 enclosure, with 365day 24/7 astronomical digital time. (for GFI’s)
- Lighting contactor, 6-pole, 30A, 240V rated, with 120V AC 10A minimum coil (2 total)
- Photocontrol, 120V, mounted through internal viewing window or drilled hole.
- Thermostat, 120V line voltage control, with 500W, 120V strip heater mounted inside of cabinet.
- Thermostat, 120V line voltage control with 100CFM exhaust fan mounted in cabinet.
- Louver in door with air filter.

Load Center Cabinet to be installed on new concrete foundation as shown and as directed. Contractor responsible for coordinating foundation dimensions to be 6-inches wider than cabinet. Furnish and install a paved pad in front of the control cabinet. This pad shall be of cement concrete, built in accordance with the sidewalk specification applicable to this project, approximately level, approximately 1" above the surrounding unpaved surface, or at even grade with the adjacent surface if paved.

EXECUTION:

This section covers the requirements for installation of materials, proper workmanship, testing, cleaning, grounding, and work methods to be followed by the Contractor. This Section also includes specific instructions and to be used in conjunction with the contract Drawings. Any discrepancies noted between the specification, Drawings, and actual installation shall be reported immediately. Failure on the part of the Contractor to report discrepancies immediately will be considered negligent.

Work will be coordinated such that systems can be properly located, and conflicts and delays are avoided.

Materials and Workmanship:

The Contractor’s work shall be executed in workmanlike manner and shall present neat, rectilinear and mechanical appearance when completed. Material and equipment shall be new and installed according to manufacturer’s recommended best practice so that complete installation shall operate safely and efficiently.

Testing, Inspection & Cleaning

The Contractor will test wiring and connections for continuity and grounds before fixtures are connected; demonstrate insulation resistance by megger test as required at not less than 500 volts. Insulation resistance between conductors and grounds for secondary distribution systems shall meet National Electrical Code (NEC) requirements.

Grounding

The Contractor shall ensure bond and ground equipment and systems connected under this Section are in accordance with standards of the NEC and other applicable regulations and codes.

The Conduit system shall be electrically continuous throughout, grounded at service entrance. Equipment frames, enclosures, boxes, etc. shall be grounded by use of green-jacketed (or bare copper) ground, sized as per Table 250-95 of the NEC.

Green bonding jumper shall be installed in flexible conduits.

Copper fittings for ground connections shall conform to the requirements of ASTM B 30. All bolts, u-bolts, cap screws, nuts, and lock washers for copper fitting shall be of approved corrosion-resisting material.

Ground Rods shall be 5/8” diameter and 8’ in length, solid copper as required by applicable codes (NEC, NESC). Bonding connections to ground rods shall be permanent, welded or crimped, with copper connectors. All wire used for grounding shall be no smaller than #4 Awg copper, stranded conductor.

Contractor to provide two (2) 5/8” x 8’-0” copper ground rods, to be installed around the base of the new metering cabinets. Grounding to be installed per installation detail.

Electrical Service Conduit Installation:

Conduit sweeps at metering cabinet shall be rigid galvanized steel (RGS), 24” minimum radius (as required by Utility). Provide 3-conductor, #3/0AWG 600V service cable with ground to utility transformer for new 200A service to metering cabinet.

Load Center Cabinet Installation:
Contractor to provide new outdoor NEMA 3R stainless steel Highway Lighting Control Center Cabinet (factory painted color: black), with 200 amp, 5 terminal, meter socket mounted on the side of meter cabinet as indicated on the Drawings. Contractor shall coordinate the incoming underground 200-amp service from the utility to the new Highway Lighting Control Center Cabinet. The cabinet foundation shall be provided with a 12-inch layer of 3/4" crushed stone (M2.01.4) under the foundation for drainage.

The street lighting cabinets will require temporary service connection if new undergrounding service connection location as shown on the plan is not ready. Temporary power shall consist of a 3" NM Schedule 80 conduit to the closest adjacent existing wooden utility pole with available electrical secondary cables. Contractor shall provide secondary cabling for 200A, single phase, 120/240V three-wire service from utility pole riser to consist of 3W#3/0Awg with #4Awg ground, type XHHW-2 600V power cable. Contractor shall install steel 3" riser pole conduit per local utility requirements. Contractor shall feed meter socket on Electrical Cabinet, while providing provision for future underground service connection from new infrastructure as shown on Contract Drawings. Contractor shall provide all materials and labor and installation for a complete functional electrical service without any additional compensation.

Photocell
Contractor to provide photocell to control lighting as part of this lump sum item. Photocell to be mounted on inside of cabinet through viewing window. Contractor to provide 3/4” galvanized steel electrical conduit and cabling for photocell, as shown on drawing for power to photocell, for a complete working system.

COMPENSATION:
Payment made under this Item will be at the Contract Unit Price bid per each, which sum shall include all labor, materials, concrete foundation, equipment required to furnish, install and test, complete in place and operational, the load center as specified herein. This price shall include associated electrical components, temporary service connection, miscellaneous hardware, service connection and 3 inch rigid steel conduit required for the service connection. It shall also include furnishing and installing all wiring and related connections, splices and hardware and incidental labor and equipment to complete and make operation the entire related lighting and outlet system. Payment shall include the provision of 3’ x 4’ Concrete pad as detailed on the plans.

No additional compensation will be made to Eversource fees or charges. Contractor shall be responsible for all charges and fees assessed by Eversource.

Lighting Controllers

Refer to drawings for details.

Outdoor Outlets:

Contractor to provide pole mounted outdoor weather proof double duplex outlets w/GFI mounted as detailed in drawings.

All work performed shall be in accordance with Section 820, Highway Lighting of the Standard Specifications, and as specified in on the plans

The rigid conduit from each pedestal to Eversource secondary from manhole or riser pole and service conductors, as shown in drawings shall be included under this item. Contractor shall coordinated with Eversource on penetrations into the Eversource manhole or connection to riser pole. The Contractor shall to connect conductors at service pedestal and the utility to connect make the connection to its system. Contractor shall be responsible for charges.

Under this Item Contractor shall furnish and install all wire and cable in accordance with the relevant provisions of Section 813 of the Standard Specifications. All wire and cable shall be U.L. listed including Wire Type 7 No. 10, No.6 and No. 2 - General Purpose. The entire electrical wiring system for all service pedestals and their systems shall be tested for continuity, grounds and resistance to ground, insulation resistance, shorts, and opens in accordance with the requirements of Section 800 of the Standard Specifications.

LIGHT POLE AND LUMINAIRE REMOVED AND STACKED

ITEM 823.71 **EACH**

The work to be done under this Item shall conform to the relevant provision of Section 820 and the following:

The section shall include all removal and stacking of existing light poles and luminaires at the locations indicated on the plans or as directed by the Engineer. The work shall include but not be limited to the decommissioning of these lights, plugging of abandoned duct, removal of existing pull boxes, removal of remaining foundations, and stacking of materials as specified in the Materials Removed and Stacked section of this document and all other work necessary and relating to the removal and stacking of existing light poles and luminaires to the satisfaction of the Engineer. The Contractor shall be required to have the other portions of the lighting system remain operational after the designated lights are removed.

The work shall also include coordinating with the Utility Company for the removal of cobra headlights from wooden utility poles to remain, where shown on the plans.

The Contractor shall be required to place any work orders required by the Utility Company and pay any fees for this work.

Payment under this Item shall be at the Contract Lump Sum bid for light poles and light to be removed and stacked including, removal of foundations and other appurtenances, coordination and the Utility Company and payment of required fees, and performance of all electrical work to decommission lights and return the remaining portion of their system to an operation status.

If it is determined that pull boxes and conduit are required they shall be provided and paid for under the respective Items of this contract.

LIGHTING FIXTURE - TYPE A 70W - 14 FOOT POST TOP

ITEM 823.94 **EACH**

The work under this Item shall conform to the relevant provisions of Section 820 of the Standard Specifications for Highways Bridges and shall include furnishing exterior lighting as shown on the drawings.

SUBMITTALS

The Contractor shall provide shop detailed and dimensioned shop drawings showing size, materials, construction for all lighting fixtures (Driver and Lamp Data Sheets), poles, anchor bolts, low profile GFCI box, and equipment. Contractor shall provide Warranty statement from manufacturers.

MATERIALS

Type A Light Poles

Type A Light Poles shall be model # RSA14D4-4-188-BA as manufactured by Hapco Poles of Abingdon, Va or equal by King Luminaire Agility KAS4-RE-A-14 and Lumecon U-RSSA-4-14-1.

Design:

The complete lighting standard, including shaft, cast aluminum pole base plate and two-piece steel base cover shall be designed to support luminaires with an Effective Projected Area (EPA) ratings as designated for the specified wind speeds. The design criteria used shall be based on the 2013 edition of the' American Association of State Highway and Transportation Officials', " Standard Specifications for Structural Supports for Highway Signs, Luminaires and Traffic Signals." The aluminum alloys designated herein are per the Aluminum Association Standards.

Shaft:

The shaft shall be fabricated from a seamless extruded tube of 6063 aluminum alloy per the requirements of ASTM B221 and shall be fully heat treated to achieve a T6 temper after the assembly has been welded. Poles shall have a hand hole (access) located 18" above the bottom surface of the baseplate. An electrical grounding lug shall be provided near the opening for easy wire attachment. A curved, lap-style curved aluminum hand hole cover shall be fastened by means of two stainless steel. The hand hole shall be oval, and the size shall be 2" x 4". The shaft shall have a minimum wall thickness of 0.188 inches and be of sufficient strength to keep deflection of the luminaire to less than 5% of the shaft length.

Base & Base Cover:

The structural pole base shall be of cast aluminum alloy 356-T6 per ASTM B26 or B108 and be of one-piece construction. The base shall be heat treated to a T6 temper after welding. The base/shaft connection shall have a tight tolerance fit before welding. The shaft shall be joined to the base with two circumferential welds at the top and bottom of the base. The assembly shall be heat treated after welding to achieve maximum material R properties.

Each pole shall be supplied with a base cover of a two-piece design, fabricated from 11-gauge carbon steel and designed to be flush mounted with top cover set to top of finish grade pavers. The steel base cove shall be hot dipped galvanized prior to powder coating.

Anchorage:

Steel anchor bolts are manufactured to AASHTO specification M314-90, Grade 55 (55,000 psi minimum yield strength), meeting the requirements of ASTM A576. Galvanizing to be per AASHTO M234 Class C (ASTM A153).

Tenon:

Pole tenon shall be 2 7/8” O.D. x 3” Long aluminum, 6063-T6 aluminum and welded to the pole top.

Power Outlet:

A 20 Amp GFCI Outlet & Low Profile and Weatherproof While-In-Use Cover shall be supplied with each light pole for field installation by the contractor. The cover shall be a metallic type with a maximum depth of 2” and expandable while in use to 3”. The cover shall be factory powder coated black to match the pole finish.

Welding:

All welding shall be performed by certified welders using the inert gas-shielded arc method with a consumable electrode. Welding must comply with the American Welding Society Specification 01.2, Structural Welding Code -Aluminum. All parts shall be cleaned prior to welding by chemical or mechanical means.

Finishing:
Pole shafts shall be satin ground, chemically etched, sanded or shot blasted to ensure proper powder coat surface adhesion. To ensure that the prepared parts are kept clean and not exposed to dirt, dust, grease or oil and to ensure maximum powder coat adhesion, the product shall proceed continuously and immediately to the powder coating process within the same facility where the poles and arms are manufactured.

Powder coating material shall be a thermosetting polyester powder. A minimum coating thickness of 2.0 mils shall be maintained for aluminum. Application of powder shall be electrostatically applied by a closed loop automated powder coating system featuring twelve automatic spray guns with computerized controls and positioners to assure mil thickness conformance. The powder shall be applied only when both the ambient and part temperatures are 50 degrees F. or above. Once powder coated, the product shall proceed through a curing oven operating at 400 degrees Fahrenheit that has been surveyed and certified for temperature uniformity. The product shall move continuously through the oven from beginning to end and shall attain the appropriate time at temperature to cure the finish in accordance with the paint manufacturer's recommendations. Once oven cured, the product shall move immediately to and continuously through a forced air-cooling tunnel designed to restore the product to acceptable packaging temperature prior to inspection and packaging. Upon exiting the cooling tunnel, the product shall be immediately inspected.

Grounding:
Poles must be grounded in accordance with the requirements of the National Electrical Code and applicable local codes. All poles shall be provided with provisions for grounding.

Packaging:
All poles shall be spirally wrapped with protective crinkle kraft paper. If outdoor storage or storage in moist areas is anticipated, the wrapping should be removed to prevent watermarking and staining. The poles shall not be allowed to rest directly on the ground. Do not cover the poles with a tarpaulin or similar cover. Additional packaging may be provided depending on the shipping method. Small parts shall be packaged in boxes.

Experience/Warranties:
The light pole manufacturer shall have been in the business of manufacturing outdoor lighting products for the municipal street lighting market for a minimum of ten (10) years. The manufacturer shall provide a minimum of a 10-year product warranty and 5 year warranty on the paint finish against peeling, cracking or excessive fading.

Type A - Decorative Luminaire
Decorative Luminaire shall be Spring City Electrical Mfg. Co "Duluth" series or equal product manufactured by Newstamp Lighting Model 614P and King Luminaire Model K59MOD.

Design:
The decorative luminaire shall be a chamfered square design, constructed from a 356-aluminum alloy frame and enclosed with clear acrylic lens panels as detailed and dimensioned in the contract documents.

Light Engine:
The LED light engine shall employ (4) 7.5 watt, 2700K, 680 lumen, LED "Silver Bowl" filament lamps mounted in a candela socket cluster and a single 40 watt chip-on-board engine mounted under the top roof lid. The chip-on-board optical lens shall be a injection molded refractive optic, producing a Type III roadway distribution. The LEDs and LED driver shall operate over a -40°C (-40°F) to +55°C (131°F) ambient air temperature range.

The electrical assembly shall be contained in aluminum housing with single removable wiring chamber door for ease of wiring and maintenance and be secured with a stainless-steel screw and lanyard. The luminaire shall have an all-cast aluminum housing providing for a slip fitter end mounting. Wire chamber terminal block shall accept a #10 AWG conductor. Quick disconnect harness shall be included to allow for mate and break under load for ease of maintenance.

Performance:
The 70-watt (nominal) luminaire shall provide an initial minimum 4,970 lumens for the LED package with driver operating at a maximum of 1050 mA; Average delivered lumens over 50,000 hours shall be a minimum of 90% of initial delivered lumens as determined in accordance with IESNA LM-80. LEDs driver shall have a power factor of >90% and THD < 20% at full load and operate on 120-277 volts input. Electronic driver efficiency shall be greater than 90%. The luminaire shall be furnished with the manufacturer's LED/driver power package combination configured/sized to deliver the minimum initial lumens indicated. The luminaire shall be suitable for and UL listed for wet locations.

Finishing:
The finish shall be a non-textured, polyester powder coat, electrostatically applied and thermo-cured to match the pole finish. The color shall be Federal Standard 17038 - Gloss Black.

METHOD OF CONSTRUCTION

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for Lighting Fixture Type A shall be made at the Contract Unit Prices bid per Each including pole, luminaire, reinforced concrete foundations and miscellaneous equipment. No separate payment shall be made for wiring, splices, fusing, grounding and connections installed within the luminaire, but all costs in connection therewith shall be included in the Contract unit price bid.

LIGHTING FIXTURE -
ITEM 823.95 TYPE B 160W - 26 FOOT POLE EACH

LIGHTING FIXTURE -
ITEM 823.96 TYPE C 160W - 26 FOOT POLE WITH FLOOD LIGHT EACH

LIGHTING FIXTURE -
ITEM 823.97 TYPE D 110W - 26 FOOT POLE EACH

LIGHTING FIXTURE -
ITEM 823.98 TYPE E ON UTILITY POLE EACH

LIGHTING FIXTURE -
ITEM 823.99 TYPE F – LUMINAIRE ONLY EACH

The work under these Items shall conform to the relevant provisions of Section 820 of the Standard Specifications for Highways Bridges and shall include furnishing exterior lighting as shown on the drawings.

SUBMITTALS

The Contractor shall provide shop drawing showing size, materials, construction for all lighting reinforced concrete foundations, fixtures, poles, and equipment.

MATERIALS

LIGHTING FIXTURE	DESCRIPTION (BY LUMEC)
TYPE B-1	Luminaire – **ULM100-160W96LED3K-G2-LE3-UNV-DMG-RCD7-BKTX** Bracket – **UBM100-1A-BKTX** Pole **- UPM100-17-[GFI-M-009]-BKTX**
TYPE B-2	Luminaire – **ULM100-160W96LED3K-G2-LE4-UNV-DMG-RCD7-BKTX** Bracket – **UBM100-1A-BKTX** Pole **- UPM100-17-[GFI-M-009]-BKTX**
TYPE C-1	Luminaire – **ULM100-160W96LED3K-G2-LE4-UNV-DMG-[RCD7-027]-BKTX** Bracket – **UBM100-1A-BKTX** Mid-Pole Luminaire – **[ULFL100-009]-55W32LED3K-G2-RM-UNV-DMG-FAWS-BKTX** Mid-Pole Bracket **- UBFL100-F-180deg-BKTX** Pole **- UPM100-17-[GFI-M-009]-MPL-14-BKTX**
TYPE C-2	Luminaire – **ULM100-160W96LED3K-G2-LE3-UNV-DMG-[RCD7-027]-BKTX** Bracket – **UBM100-1A-BKTX** Mid-Pole Luminaire – **[ULFL100-009]-55W32LED3K-G2-RM-UNV-DMG-FAWS-BKTX** Mid-Pole Bracket **- UBFL100-F-180deg-BKTX** Pole **- UPM100-17-[GFI-M-009]-MPL-14-BKTX**
TYPE D	Luminaire – **ULM100-100W64LED3K-G2-LE3-UNV-DMG-RCD7-BKTX** Bracket – **UBM100-1A-BKTX** Pole **- UPM100-17-[GFI-M-009]-BKTX**
TYPE E-1	Luminaire – **ULM100-160W96LED3K-G2-LE3-UNV-DMG-RCD7-BKTX** Bracket – **UBM100-1A-WOOD POLE MOUNT-BKTX**
TYPE E-2	Luminaire – **ULM100-100W64LED3K-G2-LE3-UNV-DMG-RCD7-BKTX** Bracket – **UBM100-1A-WOOD POLE MOUNT-BKTX**

LIGHTING FIXTURE	DESCRIPTION (BY SPRING CITY)
TYPE - F	Houston LED Luminaire – Complete luminaire change-out Catalogue Number **- ALMHST-LE020-/EVX/BL1-27-CR5-GSCS-C**

Luminaires

Housing: Exclusive shape made of extruded 6063-T6 Aluminum alloy 0.188 (4.8mm) minimum thickness. Mechanically assembled on a rectangular tenon having 1 3/4" x 1 3/4" (44mm x 44mm) by 7 1/4" (184mm) long. Comes with 2 hexagonal bolts 1/2 13 UNC for ease of maintenance and installation. The housing is complete with a secured door avoiding accidental dropping giving access to the quick disconnect wiring connection.

Light Engine: Composed of 5 main components: Heat Sink / Lens / LED Module / Optical System / Driver Electrical components are RoHS compliant.

Heat Sink: Made of cast aluminum optimising the LEDs efficiency and life. Product does not use any cooling device with moving parts (only passive cooling device).

Lens: Made of clear polycarbonate curved lens, permanently assembled and sealed onto the lower part of the heat sink.

Lamp: Powered by 3 lamp modules of 32 LED and 2 drivers per complete assembly, drivers are located inside pole base.

LED Module: Composed of 96 high-performance white LEDs. Color temperature as per ANSI/NEMA bin Warm White, 3000 Kelvin nominal (3045K +/- 175K or 2870K to 3220K), CRI 70 Min. 75 Typical.

Optical System: (LE3), IES type III (asymmetrical). Composed of high-performance acrylic refractor lenses to achieve desired distribution optimized to get maximum spacing, target lumens and a superior lighting uniformity. System is rated IP66. Performance shall be tested per LM-63, LM-79 and TM-15 (IESNA) certifying its photometric performance. (Designed for easy replacement, only one possible position for the installation to ensure proper distribution).

End Cap: Made of cast A356 Aluminum alloy 0.188 (4.8mm) minimum thickness, mechanically assembled to the housing.

Driver: High power factor of 90% minimum. Electronic driver, operating range 50/60 Hz. Auto-adjusting universal voltage input from 120 to 277 VAC rated for both application line to line or line to neutral, Class 1, THD of 20% max. Maximum ambient operating temperature from -40F(-40C) to 130F(55C) degrees.

The current supplying the LEDs will be reduced by the driver if the driver experiences internal overheating as a protection to the LEDs and the electrical components. Output is protected from short circuits, voltage overload and current overload. Automatic recovery after correction. Standard built-in driver surge protection of 2.5kV (min).

Driver Options: (DMG), Dimming compatible 0-10 volts.

Surge Protector: Surge protector tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/10kA waveforms for Line-Ground, Line-Neutral and Neutral-Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid-State Street Lighting Consortium) model specification for LED roadway luminaires electrical immunity requirements for High Test Level 10kV / 10kA.

Luminaire Options: RCD7 Receptacle with 7 pins enabling dimming and with two extra connections for future SR use (these connections are capped off at the factory if SR option isn't selected), can be used with a twist lock control device or photoelectric cell or a shorting cap or wireless node (by others). Use of photocell or shorting cap is required to ensure proper illumination. Receptacle connections to control ON/OFF for and dimming functions for the main luminaire only.

Brackets

Arm: Shall be made from bent extruded aluminum 6061-T6 alloy 0.188 (4.8mm) minimum thickness with exclusive shape, mechanically assembled to the pole tenon and secured with 4 socket head Allen screws 1/2 13 UNC.

Decorative Element: Decorative cover made of two-piece cast 356 aluminum components, mechanically assembled to the pole tenon without any apparent hardware.

Bracket Properties (Weight and EPA): 94 lbs (42.7 kg), 3.56 ft²

Mid-Pole Luminaire

Housing: Exclusive shape, the housing is made of cast aluminum 356 and is equipped with a double swivel mechanism offering a full orientation on the horizontal axis and of 180 degrees on the vertical axis. Vertical orientation is locked with two 3/8-16 UNC set screws. The flood light is mechanically assembled on the bracket and the horizontal orientation is locked thereon by means of a 3/8-16 UNC set screw.

Lens: Made of clear polycarbonate curved lens, permanently assembled and sealed onto the lower part of the heat sink.

LED Module: Composed of 32 high-performance white LEDs. Color temperature as per ANSI/NEMA bin Warm White, 3000 Kelvin nominal (3045K +/- 175K or 2870K to 3220K), CRI 70 Min. 75 Typical.

Optical System: (RM), NEMA type 7H x 4V, composed of high-performance acrylic refractor lenses to achieve Horizontal flood distribution (symmetrical), Rectangular Medium. System is rated IP54. Performance shall be tested per LM-63 and LM-79 (IESNA) certifying its photometric performance.

Heat Sink: Made of cast aluminum optimising the LEDs efficiency and life. Product does not use any cooling device with moving parts (only passive cooling device).

Driver: High power factor of 90% minimum. Electronic driver, operating range 50/60 Hz. Auto-adjusting universal voltage input from 120 to 277 VAC rated for both application line to line or line to neutral, Class 1, THD of 20% max. Maximum ambient operating temperature from -40F(-40C) to 130F(55C) degrees.

Surge Protector: Surge protector tested in accordance with ANSI/IEEE C62.45 per ANSI/IEEE C62.41.2 Scenario I Category C High Exposure 10kV/10kA waveforms for Line-Ground, Line-Neutral and Neutral-Ground, and in accordance with U.S. DOE (Department of Energy) MSSLC (Municipal Solid-State Street Lighting Consortium) model specification for LED roadway luminaires electrical immunity requirements for High Test Level 10kV / 10kA.

Driver: The current supplying the LEDs will be reduced by the driver if the driver experiences internal overheating as a protection to the LEDs and the electrical components. Output is protected from short circuits, voltage overload and current overload. Automatic recovery after correction. Standard built-in driver surge protection of 2.5kV (min).

Driver Options: (DMG), Dimming compatible 0-10 volts.

Luminaire Options: (FAWS), Field Adjustable Wattage Selector, pre set to the highest position, can be manually switched in the field to the required position. This reduces total luminaire wattage consumption and reduces the light level see the FAWS multiplier chart for more details, (ULFL100-009) FAWS located behind the access door, at the base of the pole.

Poles

Pole Shaft: Shall be made from spun aluminum 6063 T4, tempered to T6 after welding, having a base diameter of 10" (254mm) with 4'-0"(1219mm) straight and top diameter of 8" (203mm) with 10"(254mm) straight, wall thickness 0.250" (6.4mm) welded to both the bottom and top of the anchor plate.

Maintenance Opening: The pole shall have a 4 1/8" x 18" (105mm x 457mm) maintenance opening centered 36" (914mm) from the bottom of the anchor plate, complete with a weatherproof aluminum cover and a copper ground lug.

Base Cover: Two-piece round base cover made from cast 356 aluminum, mechanically fastened with two stainless steel screws discreetly concealed.

IMPORTANT: Lumec strongly recommends the installation of the complete lighting assembly with all its accessories upon the anchoring of the pole. This will ensure that the structural integrity of the product is maintained throughout its lifetime.

Pole Weight: 135 lbs (61.4 kg)

LED Luminaire Change-out (for Lighting Fixture - Type F)

Manufacturer	Spring City Electrical Manufacturing, Co.
Style	Houston LED Luminaire
Height	19 7/8"
Width	19" DIAMETER
Material	SPUN ALUMINUM AND CAST ALUMINUM ALLOY ANSI 356 per ASTM B26-95
Globe	CLEAR GLASS
Finish	POWDER COAT - RIVER TEXTURE GLOSS BLACK
Lamping	20-WATT LED SYSTEM
Voltage	ELECTRICALLY WIRE AT 120-277 VOLTS
Color Temp.	2700K (INCANDESCENT WHITE)
Optical System	TYPE V DISTRIBUTION
Surge	10kV

Miscellaneous Equipment

Wiring: Wiring completely included with connector. Length supplied is from luminaire to the pole base with 6" (152mm) minimum exceeding from maintenance opening. Wiring will be shipped in a separate box and will be installed by others, only the bracket is pre-wired for ease of installation.

Hardware: All exposed screws shall be complete with Ceramic primer-seal basecoat to reduce seizing of the parts and offers a high resistance to corrosion. All seals and sealing devices are made and/or lined with EPDM and/or silicone and/or rubber.

Anchor Bolts: Anchor bolts made of ASTM F1554 grade 55 steel with a minimum yield strength of 55,000 psi. Nuts made of ASTM F1554-99 grade A steel or better. The thread adjustment is ANSI class 2B regardless of the diameter of the bolts. Washers made of ASTM grade F-844 steel or better. All galvanized parts are hot-dip galvanized with minimum requirement the ACNOR G-164 standard.

Foundation: The cylindrical foundation shall be appropriately sized for the lighting pole, luminaire and accessories, and shall be constructed with the necessary anchor bolts, reinforcing steel, conduit elbows or sweeps, etc. and in accordance with the applicable requirements of Section 901. Cement Concrete Masonry. Foundations shall be made of minimum 4,000 psi concrete (at 28 days), 3/4 inch, 610 lb and have steel reinforcement meeting ASTM A-615, grade 60 (cover to steel, 2” minimum).

Finish: Color to be black textured RAL9005TX (BKTX) and in accordance with the AAMA 2603 standard. Application of polyester powder coat paint (4 mils/100 microns) with ± 1 mils/24 microns of tolerance. The Thermosetting resins provides a discoloration resistant finish in accordance with the ASTM D2244 standard, as well as luster retention in keeping with the ASTM D523 standard and humidity proof in accordance with the ASTM D2247 standard.

The surface treatment achieves a minimum of 2000 hours for salt spray resistant finish in accordance with testing performed and per ASTM B117 standard.

LED products manufacturing standard: The electronic components sensitive to electrostatic discharge (ESD) such as light emitting diodes (LEDs) are assembled in compliance with IEC61340-5-1 and ANSI/ESD S20.20 standards so as to eliminate ESD events that could decrease the useful life of the product.

Quality Control: The manufacturer shall provide a written confirmation of its ISO 9001-2008 and ISO 14001-2004 International Quality Standards Certification.

Vibration Resistance: The ULM100 meets the ANSI C136.31-2001, American National Standard for Roadway Luminaire Vibration specifications for normal applications. (Tested for 1.5G over 100 000 cycles)

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

Payment for Lighting Fixture Type B-1, B-2, C-1, C-2, D, E-1, E-2 and F shall be made at the Contract Unit Prices bid per Each including luminaire, bracket, mid-pole luminaire, mid-pole bracket, pole or wood pole bracket, LED Luminaire Change-out (for Lighting Fixture - Type F), reinforced concrete foundations and miscellaneous equipment. No separate payment shall be made for wiring, splices, fusing, grounding and connections installed within the luminaire, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 825.05 LIGHT POST REMOVED AND RESET EACH

All work shall be done in accordance with the relevant provisions of the Standard Specifications and the following:

The Contractor shall notify the owner before starting any work. The work shall include disconnecting the wiring, removing the light post, providing and installing new conduit, new cable (splices will not be acceptable), making all connections as required and resetting the light post on new foundation. The size of the new foundation shall be the same as the existing foundation.

The contractor shall remove light post and rest as shown on the plans and as directed by the Engineer.

Payment for Item 825.05 shall include all work necessary for removing and resetting the light post complete in place including all necessary or incidental materials and labor.

ITEM 825.06 LIGHT POST REMOVED AND REPLACED EACH

All work shall be done in accordance with the relevant provisions of the Standard Specifications and the following:

The Contractor shall notify the owner before starting any work. The work shall include disconnecting the wiring, removing the light post, foundation and providing and installing new conduit, new cable (splices will not be acceptable), making all connections as required and setting the new light post (type A) on new foundation as detailed and per Item 823.94.

The contractor shall remove the five (5) existing light post and luminaire labeled as LP 51, 53, 55, 57 and 61 on the Lighting Plans and deliver per Item 101.01 as shown on the plans and as directed by the Engineer. Electrical work for these lights shall follow note 17 on the Lighting Plans.

Payment for Item 825.05 shall include all work necessary for removing existing light pole, foundation and luminaire, installing new post-top light (type A) and foundation and resetting or replacing adjoining pavements to match, complete in place including all necessary or incidental materials and labor.

WARNING-REGULATORY AND
ITEM 832. ROUTE MARKER-ALUMINUM PANEL (TYPE A) SQUARE FOOT

The work to be done under this Item shall include all hardware, brackets, bolts, etc., necessary to attach regulatory signs with one another; also route marker assemblies on the same support as shown on the plans. Street name signs shall also be included for payment under this Item.

Legends, borders, and backgrounds of new signs shall be fabricated from retro-reflective sheeting conforming to either ASTM D4956 Type III or IV (high intensity) or ASTM D4956 Type VII or better (prismatic high-intensity), except that background sheeting for signs with white backgrounds shall conform to ASTM D4956 Type III or IV (high-intensity).

Legends and borders should be applied to the sign using either the Direct Applied method (Type B legend) or the Silk Screen process (Type C legend). Use of the so-called “ElectroCut” process to fabricate signs is considered an acceptable alternative to this requirement.

Sign blanks shall be fabricated from Type “A” (sheet) aluminum 0.080 inches in thickness conforming to ASTM B209 Alloy 6061-T6 or Alloy 5052-H12.

Payment for work under this Item shall be at the Contract Unit Price bid per Square Foot, which price shall be full compensation for sign panel, hardware, brackets, bolts, painting, and equipment necessary for installation.

Sign post assembly with foundation shall be paid for under Item 847.2.

ITEM 847.2 SIGN SUPPORT - 2 INCH ALUMINUM EACH

The work under this item shall include furnishing and installing and the following:

All new sign poles shall be aluminum and breakaway. The size of the pole shall be 2 3/8 inch O.D. round. All poles shall be polyester powder coat painted gloss black. Powder coated aluminum round posts with black domes caps and brackets for mounting.

The breakaway coupler shall be located above ground. The foundation of the breakaway post shall not compromise the installation of the brick sidewalk.

The sign pole shall be centered in the foundation with a 7 foot distance from the finished surface to the bottom of the sign and not less than 18 inches from the face of curb, unless otherwise directed by the Engineer.

The “Welcome To Lexington” sign, at Station 18+52 LT will be reset on Item 847.3 Sign Support - 3 Inch Aluminum as noted on the plans. All other signs will be either reset or mounted, as indicated on the plans, on the new posts under this item.

BASIS OF PAYMENT

Sign poles furnished and installed will be paid for at the contract unit price per each, which price shall include all labor, materials, equipment, and incidental cost required to complete the work.

ITEM 847.3 SIGN SUPPORT - 3 INCH IRON EACH

The work under this item shall include furnishing and installing and the following:

All new sign poles shall be aluminum and breakaway. The size of the pole shall be 12 feet long x 3 inch I.D. round. All poles shall be polyester powder coat painted gloss black. All poles shall be polyester powder coat painted gloss black. Powder coated aluminum round posts with powder coated ball finials and brackets for mounting.

The foundation of the post shall not compromise the installation of the brick sidewalk. The sign pole shall be centered in the foundation with a 7 foot distance from the finished surface to the bottom of the sign and not less than 18 inches from the face of curb, unless otherwise directed by the Engineer.

The “Welcome To Lexington” sign, at Station 18+52 LT will be reset as noted on the plans.

BASIS OF PAYMENT
Sign poles furnished and installed will be paid for at the contract unit price per each, which price shall include all labor, materials, equipment, and incidental cost required to complete the work.

ITEM 852. SAFETY SIGNING FOR TRAFFIC MANAGEMENT SQUARE FOOT

Work under this Item shall conform to the applicable requirements of Sections 828 and 840 of the Standard Specifications. Upon completion of the project construction signs, including support posts, shall be removed to a depth of at least 6 inches below grade.

Payment under this Item shall by a the Contract Unit Price bid per Square Foot, which price shall include the furnishing, installation, maintenance, removal, resetting and all labor, materials, equipment, transportation, and incidental costs to complete the work to the satisfaction of the Engineer.

ITEM 852.11 TEMPORARY PEDESTRIAN BARRICADE FOOT
ITEM 852.12 TEMPORARY PEDESTRIAN CURB RAMP EACH

DESCRIPTION
Work under these items consist of furnishing, deploying, maintaining in proper operating conditions, and removing temporary pedestrian barricades and temporary pedestrian ramps as part of a Temporary Pedestrian Access Route (TPAR) in order to guide pedestrians around a fully- or partially-closed sidewalk. These devices are intended to prevent pedestrians from entering the work area and to prevent pedestrians from inadvertently entering the vehicle travel lane by providing visual and physical separation between each space.

MATERIALS
The Temporary Pedestrian Barricade shall have a continuous bottom rail or edge no more than two (2) inches above the ground and six (6) inches in height (minimum) to accommodate cane users, have a smooth and continuous hand railing along the top edge no less than 32 inches above the ground and not obstruct or project into the pedestrian path of travel. Barricade walls shall be nearly vertical and generally within the same plane.

If exposed to traffic, Temporary Pedestrian Barricades shall be crashworthy.

The Temporary Pedestrian Curb Ramp shall provide a 60 inch minimum width, with a firm, stable, and non-slip surface. Protective edging with a two (2) inch minimum height shall be installed when the curb ramp or landing platform has a vertical drop of six (6) inches or greater.

The Temporary Pedestrian Curb Ramp walkway and landing area surface shall be of a solid, continuous, contrasting color abutting up to the existing sidewalk.

If a Temporary Pedestrian Curb Ramp leads to a crosswalk, a detectable warning pad must be used at the base of the ramp; if it leads to a protected path that does not conflict with vehicular traffic then a detectable pad shall not be used.

CONSTRUCTION METHODS
The Temporary Pedestrian Barricade shall be placed in an area that will provide pedestrians with a TPAR on a smooth, continuous hard surface for its entirety. The geometry and alignment of the facility shall meet

the applicable requirements of the “Americans with Disabilities Act Accessibility Guidelines for Buildings and Facilities” and the Massachusetts Architectural Access Board.

The recommended width of the TPAR is 60 inches, but if constraints exist a minimum clear width of 48 inches shall be provided along its entirety. If a 60 inch width cannot be accommodated in full, a 60 inch by 60 inch passing space shall be provided every 200 feet or less along the TPAR.

Turning areas shall be 60 inches by 60 inches minimum.

Lateral joints between any surfaces shall not exceed 0.5 inches. Lateral edges may be vertical up to 0.25 inches high and shall be beveled at 1V:2H between 0.25 inches and 0.5 inches.

The TPAR shall be kept clear of debris, snow, and ice and the Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall not obstruct drainage.

Removal and/or resetting of Temporary Pedestrian Barricades and Temporary Pedestrian Curb Ramps shall be considered incidental.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT
Payment for Temporary Pedestrian Barricades will be made at the contract price per linear foot installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

Payment for Temporary Pedestrian Curb Ramps will be made at the contract price per each unit installed in place, including all incidental items. This price shall include the cost of furnishing, installing, resetting, removal, and maintaining in good working condition.

ITEM 854.01 TEMPORARY PAVING MARKINGS 4 INCH (PAINTED) FOOT

The work to be done under this Item shall conform to the relevant provisions of Section 850, Section 860 and the following:

The work shall include all temporary pavement markings on existing pavement, regardless of size or color. The work shall also include, to avoid confusion, the removal of existing pavement marking as deemed unnecessary by the Engineer. Painting over those markings to be removed with black paint will not be allowed.

Payment under this Item shall be at the Contract Unit Price bid per Foot, which price shall include all material, labor and equipment, including machinery to remove existing markings, to provide temporary pavement markings, to the satisfaction of the Engineer.

ITEM 854.02 TEMPORARY PAVING MARKINGS 4 INCH (TAPE) FOOT

The work to be done under this Item shall conform to the relevant provisions of Section 850, Section 860 and the following:

The work shall include all temporary pavement markings on new pavement, regardless of size or color as directed by the Engineer.

Payment under this Item shall be at the Contract Unit Price bid per Foot, which price shall include all material, labor, and equipment, to provide temporary pavement markings, to the satisfaction of the Engineer.

ITEM 860.991 TEMPORARY SIDEWALK BRIDGE LUMP SUM

Work under this item shall include the purchase, rental or fabrication, installation, removal and resetting of temporary sidewalk bridges to maintain access to abutting properties and businesses during sidewalk construction and sidewalk vault construction.

CONSTRUCTION METHODS

During sidewalk construction it may be necessary for the contractor to provide a temporary sidewalk bridge across areas of excavated or newly poured sidewalk to maintain access to businesses and other properties.

The Contractor shall be responsible to provide a safe and sturdy means of passage by pedestrians. The temporary sidewalk bridge shall be a minimum of 36” clear width with hand rails on both sides and comply with ADA regulations. The Contractor shall submit shop drawings or catalog cuts of the temporary bridge for approval by the Engineer.

BASIS OF PAYMENT

Temporary Sidewalk Bridge shall be paid for a the contract unit price per lump sum, which price shall include all labor, materials, equipment and incidental costs required to complete the work. The sidewalk bridge shall be fabricated only with the approval of the Engineer. The Contractor will not be compensated for any temporary bridge fabricated without prior approval of the Engineer. The contractor shall not be paid to remove and reset the temporary sidewalk bridge to new locations throughout the duration of the project. The removal and resetting for reuse shall be considered incidental to this item.

ITEM 864.07 PAVEMENT ARROW AND LEGENDS (EPOXY) SQUARE FOOT

12-INCH REFLECTORIZED
ITEM 868.012 PAVEMENT MARKING LINES, EPOXY RESIN FOOT

4-INCH REFLECTORIZED
ITEM 868.041 PAVEMENT MARKING LINES, EPOXY RESIN FOOT

The work under these items shall conform to the relevant provisions of Section 860 of the Standard Specifications and the following:

Work under these items shall consist of the furnishing and installation of regular-dry white and lead-free yellow EPOXY reflectorized pavement markings (including edge lines, skip lines, gore lines, arrows and legends) on all new pavement areas.

As work incidental to this Item the Contractor or epoxy Material Supplier shall measure the performance of the pavement markings upon installation according to the measurement and sampling procedures outlined in ASTM D 6359, using a new hand-held retroflectometer.

Epoxy material shall be previously approved listed on the Qualified Construction Materials List on the MassDOT website, or an approved equal.

All work shall be done in accordance with the Material Suppliers specifications and the following:

Surface Preparation

The pavement surface on which the epoxy paint material is placed shall be clean and dry. Existing traffic markings shall be removed by blasting or grinding. The curing compound on Portland cement concrete shall also be removed. Existing markings shall be removed so that at least 95% of the underlying pavement is visible. The abrasive material shall be removed from the pavement surface before the pavement is opened to uncontrolled traffic flow.

Epoxy
The epoxy paint markings shall have a thickness of 25 mils ± 1 mil, calculated without drop-on glass beads. All markings shall have uniform thickness with a uniform distribution of` glass beads throughout the line width. The width of lines shall be as specified with a tolerance of 0.25 inches. Markings shall have sharp edges and cutoff at the ends.

Glass Beads
The glass beads shall be applied by the double drop method, which requires that Type I and Type II reflective glass spheres be injected into or dropped onto the liquid epoxy marking. Each type shall be applied simultaneously, at a minimum rate of 10 to 13 pounds per gallon of resin with a minimum total application of 25 pounds per gallon. Type I beads shall be applied first, immediately followed by Type II beads. The beads shall adhere to the cured epoxy or all marking operations shall cease until corrections are made.

Temperature Limitations
During marking operations, the pavement surface where the epoxy is to be placed shall have a minimum temperature of 40° F and the air temperature shall be at least 35° F. The pavement surface temperature and the air temperature shall be determined at the start of each day of marking operation and at any time deemed necessary by the Engineer. The spraying temperatures shall be in accordance with the manufacturer's recommendations.

Application Rates
The Engineer will check application rates at convenient intervals by comparing tallies of materials used to the length of lines placed. For initial application and occasionally during the course of work, the Engineer may also check application to a pre-weighed sheet specifically placed for test purposes. Drop-on spheres shall not be applied in this test.

Protecting Newly Installed Markings
Newly installed markings shall be protected from tracking during the setting period by coning off wet lines from traffic. The contractor shall be able to install cones for prolonged periods of time, closing up to two travel lanes for a distance up to 10 miles as necessary for the markings to properly set. The exact length of the lane closure shall be determined as per the field conditions present at the time markings are applied and as directed by Engineer.

BASIS OF MEASUREMENT AND PAYMENT
The accepted quantities of markings will be paid for at the contract unit price, which shall include the cost of furnishing all labor, materials, and equipment required or incidental to satisfactorily complete the work. The cost of maintaining and protecting traffic during the marking operations shall be included in the bid price. No payment will be made for the repair or replacement of defective pavement markings.

Payment for four-inch lines shall be made at the Contract Unit Price bid per linear Foot paid under Item 868.041.

Payment for Crosswalk (12 or 24 inches wide) and Stop lines (12 inches wide) shall be made at the Contract Unit Price bid per linear Foot paid under Item 868.012. Payment for 24 inches wide lines shall be paid final installed times a factor of 2.00. Channelizing lines (12 inches wide) shall be measured for payment by the linear foot installed.

Payment for the arrows and legends will be paid for at the contract unit price.

The contract prices shall include all materials, labor and equipment required or incidental to the satisfactory completion of the work.

ITEM 874. STREET NAME SIGN EACH

The work to be done under this item shall conform to the relevant provision of Section 828 and 840, and the following:

The work shall include all materials, labor and equipment necessary to complete the design, construction and erection of the signs. Also included under this Item is all the hardware, brackets, bolts, etc., necessary to attach the panels to steel posts or mast arm poles as specified in the contract drawings.

Legends, borders, and backgrounds of new signs shall be fabricated from retro-reflective sheeting conforming to either ASTM D4956 Type III or IV (high intensity) or ASTM D4956 Type VII or better (prismatic high-intensity), except that background sheeting for signs with white backgrounds shall conform to ASTM D4956 Type III or IV (high-intensity).

Legends and borders should be applied to the sign using either the Direct Applied method (Type B legend) or the Silk Screen process (Type C legend). Use of the so-called “ElectroCut” process to fabricate signs is considered an acceptable alternative to this requirement.

Sign blanks shall be fabricated from Type “A” (sheet) aluminum 0.080 inches in thickness conforming to ASTM B209 Alloy 6061-T6 or Alloy 5052-H12.

Street name sign sizes, background color, border and legend size and color shall be as noted on the Plans. Letters shall be mixed-case (uppercase/lowercase) lettering with an initial uppercase height of 6 inches and a lowercase height of 4.0 inches. Legend font shall be Highway Gothic Series “B”, with an inter-letter spacing no less than 70% of standard and no greater than 100% of standard. The seal should be positioned to the left of the street name. Signs shall have 6” town seals placed before the street name.

Signs shall consist of two signs mounted back-to-back with bolt through method to eliminate vibration.

The street name sign panels shall be mounted with their faces parallel to the streets they name in the location shown on the plans. Street name signs shall be mounted not less than 7 feet above the top of curb, either at the same height or with one immediately above the other.

Payment for work under this item shall be at the contract unit price, each, for Item 874 - Street Name Sign, which price shall be full compensation for panel, hardware, brackets, bolts, painting, and equipment necessary for installation.

Sign post assembly with foundation, where required, shall be paid for under Item 847.2.

MISCELLANEOUS SIGNS

ITEM 874.51 REMOVED, DISCARDED, STACKED, OR RESET LUMP SUM

The work under this Item shall include removing, stacking, resetting, transportation and discarding existing warning, regulatory, historic, and miscellaneous signs and supports as shown on the plans and directed by the Engineer. The work also includes the removing and resetting of existing sign panels on new supports, as shown on the plans or as directed by the Engineer.

Existing foundations shall be removed to a minimum depth of 12 inches below the proposed finished grade and the holes backfilled with gravel. The Contractor shall be responsible for the signs and shall replace or repair at no additional compensation any signs damaged due to the contractor's operations.

The existing signs shall not be removed until the new signs and structures replacing them are ready for traffic or until the Engineer shall permit.

The "Greek Orthodox Church" sign located at Station 11+16 LT and the "Meriam Street" sign located at Station 11+24 are historical signs and shall be removed and stacked at the Lexington DPW yard.

The "Welcome To Lexington" sign located at Station 18+52 LT will be removed and reset on a new 3" post (Item 847.3 Sign Support - 3 Inch Aluminum) as noted on the plans. All other signs shall be reset on 2" posts (Item 847.2 Sign Support - 2 Inch Aluminum).

Payment for this Item shall be made at the Contract Lump Sum bid, which sum shall constitute full payment for all labor, material and equipment necessary for dismantling, loading, transporting, storing, removing and stacking existing signs and supports, resetting existing sign panels on new supports where directed to do so, excavation, gravel backfill, surface restoration where foundations are removed and any other item of work necessary to complete this Item to the satisfaction of the Engineer.

ITEM 875.1 PARKING METER POST REMOVED AND RESET EACH

The work to be done under this Item shall include the dismantling, removal, transporting and resetting of the existing parking meter posts as shown on the plans. The work also includes the removal and disposal of the existing foundations and transporting of the existing meters and non-reused posts to the Lexington DPW yard. Prior to removal of the parking meters, the Contractor shall coordinate with the Town of Lexington to ensure no money remains within the meters.

The Contractor shall exercise particular care in the dismantling, removal, transporting the existing meters and posts as they are designated to be reused. It is the Contractor's responsibility to protect the existing parking meter heads and store in a safe, dry place after dismantling and prior to delivery at the yard. Any parking meter or post damaged by the Contractor shall be replaced at the Contractor's expense.

The new support shall be in conformance with the Town's Specifications.

The Contractor shall backfill with compacted gravel all holes resulting from the removal of the parking meters and their foundations and restores the area to match existing conditions of adjacent areas.

Parking meters and posts that are not reused shall be transported from the work site to the DPW yard and carefully stacked as directed by their representative.

Payment under this Item shall be at the Contract Unit Price bid price per Each, which price shall include all labor, materials, equipment and incidental costs required to complete the work. No separate payment shall be made for the dismantling, excavation, disposal of the existing foundations and post, compacted gravel backfill and restoration of surface, but all costs in connection therewith shall be included in the Contract unit price bid.

ITEM 875.11 PARKING PAY STATION – EXCLUDE COST OF PAY STATION EACH

The work under this Item consists of installing automated parking pay stations and related support system as shown on the plans and as specified herein. The parking pay station units shall be furnished by other. Work shall conform to the relevant provisions of Section 800 and the following:

CONSTRUCTION METHODS

The Contractor shall install concrete foundations with ground rod as shown on the drawings for the pay station unit furnished by other. Prior to installing the foundation, the Contractor shall verify with the pay station supplier on the actual size of the foundation and mounting configuration. The contractor shall also verify the location of the pay station in the field with the engineer. Each parking pay station shall be installed in collaboration with the supplier of the pay station for warranty purposes. The bolts shall be drilled into the concrete foundation and epoxied in place for the base plate of the parking system.

METHOD OF MEASUREMENT AND BASIS OF PAYMENT

This Item shall be paid for at the Contract Unit Price per Each, which price shall constitute full compensation for installing a complete parking pay station, including sawcuttng, excavation, gravel borrow, concrete foundations, steel reinforcement, and all labor and incidental materials required to complete the installation to the satisfaction of the Engineer.

ITEM 875.2 PARKING METER POST REMOVED AND STACKED EACH

This work shall consist of dismantling, removing, transporting and stacking parking meter posts and non-reused posts from the locations indicated on the Plans to the Town/DPW yard.

CONSTRUCTION METHODS

Contractor shall carefully remove and store parking meters. The existing parking meters and posts shall be transported to the to the Town yard or as directed by the Engineer.

The Parking Meters shall be carefully removed in order to minimize damage to existing base. The Contractor shall replace or repair, at his own expense, any other materials damaged by its methods of dismantling and removing operations.

METHOD OF MEASUREMENT

Parking Meters Removed and Stacked shall be measured per each, removed and stacked in accordance with the plans or as directed by the Engineer.

BASIS OF PAYMENT

Parking Meters Removed and Stacked will be paid for at the Contract unit price per each, which price shall constitute full and complete compensation for all labor, materials, equipment, handling, hauling, stockpiling, the removal and disposal of existing parking meter poles, excavation and disposal of the existing foundations, the supplying and placing of compacted gravel backfill where foundations and posts are removed, restoration of surface, and all other incidentals necessary for the proper completion of this Item.

END OF SECTION

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APPENDIX A – COVID-19 Contract

SECTOR SPECIFIC WORKPLACE SAFETY STANDARDS FOR CONSTRUCTION SITES TO ADDRESS COVID-19

As of July 24, 2020

A. Enforcement and Oversight

- A site-specific COVID-19 Officer (who may also be the Health and Safety Officer) shall be designated for every site except as provided below for construction and remodeling in 1-3 family residences
- Except as provided below for construction and remodeling in 1-3 family residences, the Contractor's site-specific project COVID-19 Officer shall submit a written daily report to the Owner's Representative. The COVID-19 Officer shall certify that the contractor and all subcontractors are in full compliance with sections B to D, inclusive (the "COVID-19 Construction Safety Guidance")
- For large, complicated construction projects a city or town may additionally require the Owner to develop and submit a site-specific risk analysis and enhanced COVID-19 safety plan, which may include additional requirements to address risks specific to the project or type of project. The city or town shall review and approve such plan and may require such projects to pause construction until such a risk analysis and plan is submitted and approved. Once such an enhanced COVID-19 safety plan is approved, a violation of the plan shall be treated the same as a violation of the COVID-19 Construction Safety Guidance

- For all projects undertaken, managed or funded by a state agency or authority there shall be joint enforcement responsibility between the project's public Owner and the city or town where the project is located. The Owner of a public project has the lead responsibility for compliance and enforcement including frequent on-site inspections by an employee or contractor of the state agency or authority who is familiar with the COVID-19 Construction Safety Guidance and is authorized to enforce that guidance and shut down work at the site if violations are found. The Owner of the project is required to notify the municipality where the work is taking place whenever a site is shut down or of any violations of the COVID-19 Construction Safety Guidance and the resulting corrective action plan, as well as to provide copies of the COVID-19 Officer's written daily reports upon request. While the public Owner has the lead responsibility for enforcement, cities and towns retain the authority to take enforcement action against public projects found not in compliance with the COVID-19 Construction Safety Guidance, including the authority to order the project to shut down until a corrective action plan is developed, approved and implemented

- Cities and towns are authorized to enforce the COVID-19 Construction Safety Guidance using their public health staff, building inspectors or any other appropriate official or contractor

- Cities and towns may enforce the safety and distance protocols including, if multiple violations are found, requiring the Owner and / or Contractor to safely secure the site and pause construction activities until a corrective action plan is prepared, submitted and approved by the city or town
- The city or town may require the Owner of a large, complicated private project to pay for an independent, third party inspector or inspection firm (or to pay into a pool to pay for such inspections). The third party inspector shall be accountable solely to the city or town and shall be responsible for enforcement on behalf of the city or town. A city or town may require private projects to pause construction until such a third-party inspector has been secured

B. Employee Health Protection – ZERO Tolerance

ZERO TOLERANCE FOR SICK WORKERS REPORTING TO WORK. IF YOU ARE SICK, STAY HOME! IF YOU FEEL SICK, GO HOME! IF YOU SEE SOMEONE SICK, SEND THEM HOME!

If you are exhibiting any of the symptoms below, you are to report this to your supervisor (via phone, text or email) right away, and head home from the job site or stay home if already there

If you notice a co-worker showing signs or complaining about such symptoms, he or she should be directed to their supervisor (via phone, text or email) and asked to leave the project site immediately

COVID-19 Typical Symptoms:

- Fever
- Cough
- Shortness of Breath
- Sore Throat

Self-certify prior to shift

Prior to starting a shift, each employee will self-certify to their supervisor that they:

- Have no signs of a fever or a measured temperature above 100.3 degrees or greater, a cough or trouble breathing within the past 24 hours
- Have not had "close contact" with an individual diagnosed with COVID-19. “Close contact” means living in the same household as a person who has tested positive for COVID-19, caring for a person who has tested positive for COVID-19, being within 6 feet of a person who has tested positive for COVID-19 for about 15 minutes, or coming in direct contact with secretions (e.g., sharing utensils, being coughed on) from a person who has tested positive for COVID-19, while that person was symptomatic
- Have not been asked to self-isolate or quarantine by their doctor or a local public health official

Employees exhibiting symptoms or unable to self-certify should be directed to leave the work site and seek medical attention and applicable testing by their health care provider. They are not to return to the work site until cleared by a medical professional

General On-the-Job Guidance to Prevent Exposure & Limit the Transmission of the Virus

- No handshaking
- Wash hands often with soap for at least 20 seconds or use an alcohol-based hand sanitizer with at least 60% ethanol or 70% isopropanol
- Contractor and State Agency Field Offices are locked down to all but authorized personnel
- Each jobsite should develop cleaning and decontamination procedures that are posted and shared. These Procedures must cover all areas including trailers, gates, equipment, vehicles, etc. and shall be posted at all entry points to the sites, and throughout the project site.
- A "No Congregation" policy is in effect, individuals must implement social distancing by maintaining a minimum distance of 6-feet from other individuals
- Avoid face to face meetings – critical situations requiring in-person discussion must follow social distancing
- Conduct all meetings via conference calls, if possible. Do not convene meetings of more than 10 people. Recommend use of cell phones, texting, web meeting sites and conference calls for project discussion
- All individual work crew meetings / tailgate talks should be held outside and follow social distancing
- Please keep all crews a minimum of 6 feet apart at all times to eliminate the potential of cross contamination
- At each job briefing / tool box talk, employees are asked if they are experiencing any symptoms, and are sent home if they are
- Each jobsite should have laminated COVID-19 safety guidelines and handwashing instructions
- All restroom facilities / porta-potties should be cleaned and handwashing stations must be provided with soap, hand sanitizer and paper towels
- All surfaces should be regularly cleaned, including surfaces, door handles, laptops, etc.
- All common areas and meeting areas are to be regularly cleaned and disinfected at least once a day but preferably twice a day
- Be sure to use your own water bottle, and do not share
- To avoid external contamination, we recommend everyone bring food from home
- Please maintain Social Distancing separation during breaks and lunch

- Cover coughing or sneezing with a tissue, then throw the tissue in the trash and wash hands, if no tissue is available then cough into your elbow
- Avoid touching eyes, nose, and mouth with your hands
- To avoid sharing germs, please clean up after Yourself. DO NOT make others responsible for moving, unpacking and packing up your personal belongings
- For guidance on business-sponsored travel, refer to the Commonwealth's current out-of-state travel order: mass.gov/MAtraveler. Employers are strongly discouraged from requiring or allowing business-related travel to destinations other than those appearing on the Department of Public Health's list of COVID-19 lower risk States. Employers that permit employer-paid or -reimbursed travel to those States should take measures to ensure employees comply with this order. Employers are also urged to strongly discourage their employees from taking leisure travel to destinations not included on the list of COVID-19 lower-risk States
- If you or a family member is feeling ill, stay home!

Work Site Risk Prevention Practices

- At the start of each shift, confirm with all employees that they are healthy
- We will have a 100% glove policy from today going forward. All construction workers will be required to wear cut-resistant gloves or the equivalent
- Use of eye protection (safety goggles / face shields) is recommended
- In work conditions where required social distancing is impossible to achieve affected employees shall be supplied PPE including as appropriate a standard face mask, gloves, and eye protection
- All employees should drive to work site / parking area in a single occupant vehicle. Contractors / State staff should not ride together in the same vehicle
- When entering a machine or vehicle which you are not sure you were the last person to enter, make sure that you wipe down the interior and door handles with disinfectant prior to entry
- In instances where it is possible, workers should maintain separation of 6 feet from each other per CDC guidelines
- Multi person activities will be limited where feasible (two person lifting activities)
- Large gathering places on the site such as shacks and break areas will be eliminated and instead small break areas will be used with seating limited to ensure social distancing.
- Contact the cleaning person for your office trailer or office space and ensure they have proper COVID- 19 sanitation processes. Increase their cleaning visits to daily
- Clean all high contact surfaces a minimum of twice a day in order to minimize the spread of germs in areas that people touch frequently. This includes but is not limited to desks, laptops and vehicles

Wash Stations

All site-specific projects with outside construction sites without ready access to an indoor bathroom MUST install Wash Stations.

- Install hand wash stations with hot water, if possible, and soap at fire hydrants or other water sources to be used for frequent handwashing for all onsite employees
- All onsite workers must help to maintain and keep stations clean
- If a worker notices soap or towels are running low or out, immediately notify supervisors
- Garbage barrels will be placed next to the hand wash station for disposal of tissues / towels

Do all you can to maintain your good health by: getting adequate sleep; eating a balanced, healthy diet, avoid alcohol; and consume plenty of fluids.

Please Note: This document is not intended to replace any formalized procedures currently in place with the General Contractor.

Where these guidance does not meet or exceed the standards put forth by the General Contractor, everyone shall abide by the most stringent procedure available.

A site-specific COVID-19 Officer (who may also be the Health and Safety Officer) shall be designated for every site.

The Contractor’s site specific project COVID-19 Officer shall submit a written daily report to the Owner’s Representative. The COVID-19 Officer shall certify that the contractor and all subcontractors are in full compliance with these guidelines.

Any issue of non-compliance with these guidelines shall be a basis for the suspension of work. The contractor will be required to submit a corrective action plan detailing each issue of non-conformance and a plan to rectify the issue(s). The contractor will not be allowed to resume work until the plan is approved by the Owner. Any additional issues of non-conformance may be subject to action against the contractor's prequalification and certification status.

Limiting Exposures

Workers should follow the General On-the-Job Guidance to Prevent Exposure & Limit the Transmission of the Virus of the COVID-19 Employee Health, protection, guidance and prevention guide.

In addition, Contractors should advise workers of best practice to limit exposures off the construction site.

When leaving a construction site for breaks, lunch, or other reasons are required to wash hands with soap for at least 20 seconds or use an alcohol-based hand sanitizer with at least 60% ethanol or 70% isopropanol before leaving the site and must maintain social distancing and wear face coverings if traveling to other locations off the construction site. Frequent use of handwashing or alcohol-based hand sanitizers should be encouraged and handwashing facilities and / or alcohol-based hand sanitizers should be made readily available at work sites.

C. Construction and Remodeling in 1-3 Family Residences

For construction and remodeling work in 1-3 family residential constructions, section B shall be modified as follows:

- The contractor does not need to designate a site-specific COVID-19 Officer (who may also be the Health and Safety Officer) for every site if there are 5 or less workers at the site at any given time. Instead, the contractor may designate a COVID-19 Officer for all such small sites in a given city or town who shall be in daily contact with each of the sites to ensure that the contractor and all subcontractors are in full compliance with this safety guidance. This COVID-19 safety officer shall prepare a written daily report covering all the small sites in each city or town and make a copy of that report available to a municipal official and / or the owner of the residence upon request

- If the project has restroom facilities / porta-potties they must be cleaned and handwashing stations must be provided with soap, hand sanitizer and paper towels. For outside construction sites without ready access to an indoor bathroom, the contractors must either install Wash Stations with hot water, if possible, and soap at fire hydrants or other water sources to be used for frequent handwashing for all onsite employees or provide each employee and subcontractor with a sufficient quantity of hand sanitizer to allow for frequent handwashing

D. Worker Infection Protocol

As stated above, there is a zero tolerance for sick workers reporting to work. Employees should be instructed that even those with mild symptoms of respiratory infection (cough, shortness of breath, sore throat) or fever should stay off work. Contractors shall take immediate steps to limit infections at the job site in the event that a worker discovered to have tested positive for COVID-19 or has COVID-19 related symptoms.

Although it is understood that contractors are enforcing Work Site Risk Prevention Practices including social distancing rules and use of PPE, consistent with guidelines it is also recognized that there may be occasions where someone who has tested positive for COVID-19 or who has COVID-19 symptoms has been present in a work area.

Prompt identification and isolation of potentially infectious individuals is a critical step in protecting workers, vendors, visitors, and others at a worksite.

Identification of Exposure

The Contractor shall direct workers with COVID-19 related symptoms to leave the jobsite immediately and contact their healthcare provider. The Massachusetts Department of Health (DPH) or a local board of health will make appropriate notifications to those who had direct prolonged contact with the COVID-19 positive workers.

The Contractor shall work with the local board of health to identify any potential job site exposures, including:

- Other workers, vendors, inspectors, or visitors to the work site with close contact to the individual
- Work areas such as supply cabinets and designated work stations or rooms
- Work tools and equipment
- Common areas such as break rooms and tables, vending machines, and sanitary facilities

Notification and Quarantine Requirements

As provided by law, the identity of the worker must be kept confidential

Upon learning of an infection, the contractor must immediately notify the designated COVID-19 safety officer, the site safety officer, and the owner

Sanitation Requirements

After a worker with COVID-19 related symptoms has been asked to leave the job site, the contractor shall take immediate steps to sanitize common areas and direct work places. This includes all on-site bathrooms facilities, any break facilities, and any other common areas on the job site that may have been in close contact with the infected worker.

Sanitation will be conducted with personnel, equipment, and material approved for COVID-19 sanitization.

Identified areas should remain isolated from workers until sanitation process has been completed and area is deemed safe for use.

Returning to Work

All impacted workers should follow CDC and DPH recommended steps concerning return to work. Workers who are considered close contacts to a COVID-19 case by public health authorities should not return for 14 days and are subject quarantine by public health.

Workers who leave during the work day due to COVID-19 symptoms and develop COVID-19 as confirmed by laboratory testing or diagnosis by a healthcare provider shall not return to the site until either released from isolation by healthcare provider or public health official.

In All Cases

- Keep all employee names confidential as required by law

- Other employees may be sent home while a workspace is being cleaned but will return to work after cleaning unless advised otherwise by a health care provider
- Other employees should be asked to contact their health provider if they have any questions
- Remind other employees to continue to practice proper sanitation and monitor for flu like symptoms